POPULAR Computing WEEKLY

35p 23-29 June 1983 Vol 2 No 24

This Week

News Desk

Major break-through for Adam

THE Colecovision Adam computer announced at the Consumer Electronics Show in Chicago a fortnight ago has been hailed as a major break-through in both pricing and performance.

The Adam, with a specification typical of machines costing four times its $600 (around £400) price tag, comes as a complete system including the memory and processor module, a separate keyboard and the SmartWriter printer.

The memory module is the Z80A-based processing heart of the Adam with 80K Ram, one built-in strings micro floppy drive, a Rom cartridge slot capable of accepting the full range of existing Colecovision games cartridges and four additional expansion slots. Screen output features 16 colours with a 32 sprite capability, and the Adam has three sound channels.

The keyboard is a separate unit with 75 full-travel keys.

The SmartWriter is a letter

Continued on page 5

Earl's Court fair a let-down

DESPITE the increased size of the 1983 Earls Court Computer Fair — with over 135 exhibitors — the event was a disappointment.

Many of the new products shown at the Commodore Show the week before — like the SX64 portable computer and the Commodore 64 Speech Synthesiser — failed even to make the mile-long journey.

Texas and Atari failed to exhibit any new hardware, and Acorn decided to hold off any new advances until its own show in August.

In what was perhaps the biggest disappointment of all, Sinclair Research had no surprises to unveil. Not even any non surprises — such as a microdrive.

So it was left to the smaller manufacturers to provide the interest. Two new computers were on display for the first time — the Memotech MTX500 machine and the

Continued on page 5

Continued on page 40

★ ★ CHICAGO FAIR EXCLUSIVE — PAGE 4 ★ ★



23-29 June 1983 Vol 2 No 25



The Team

Editor
Brandon Gora

News Editor
David Kelly [01-930 3271]

Software Editor
Graham Taylor [01-839 2504]

Production Editor
Lynne Constable

Editorial Secretary
Caroline Owen

Advertisement Manager
David Lake [01-839 2846]

Advertisement Executive
Alastair Macintosh [01-930 3260]

Classified Executive
Diane Davis [01-839 2476]

Administration
Theresa Lacy [01-930 3266]

Managing Editor
Duncan Scot

Publishing Director
Jenny Ireland

Popular Computing Weekly
Hobhouse Court 19 Whitcomb Street
London WC2 7HF
Telephone 01-839 6835
Published by Sunshine Publications Ltd
Typesetting origination and printing by
Chesham Press Chesham, Bucks
Distributed by S M Distribution
London SW9 01 274 8611 Telex 261643

Subscriptions
You can have *Popular Computing Weekly* sent to your home

UK Addresses

26 issues	£9 98
52 issues	£19 95

Overseas Addresses

26 issues	£18 70
52 issues	£37 40

How to submit articles
Articles which are submitted for publication should not be more than 3 000 words long The articles and any accompanying programs, should be original It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted

All submissions should be typed and a double space should be left between each line Please have wide margins

Programs should whenever possible be computer printed

We cannot guarantee to return every submitted article or program, so please keep a copy If you want to have your program returned you must include a stamped addressed envelope

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

This Week

Editorial

The second annual Computer Fair which was held at Earls Court last week, was more notable for its absentees than for its participants There was no Electron and, despite rumours to the contrary no microdrive

The microdrive was first announced at last year s Computer Fair — more than 14 months ago — with the immortal phrase coming soon' Despite intense pressure from aggrieved Spectrum owners, and the appearance of a microdrive case at one computer show it is still ' coming soon Indeed the recent Sinclair advertisements have omitted to mention the microdrive at all

Provided the microdrive lives up to its specifications — storage of up to 100K, transfer rate of 16K a second and an access time of 3 5 seconds — it is still likely to prove extremely popular But if the microdrive does not appear soon, Sinclair may yet find the Japanese have beaten him to it

The other notable absentee from this year s Computer Fair the Electron, is likely to appear at the Acorn User exhibition in August While this is not quite as late as the microdrive it is still a long time in a market that is becoming increasingly competitive

All in all, the Computer Fair this year has been fairly subdued compared to last year's extravaganza which coincided with the launch of the Spectrum

Next Thursday

Play next week s star game, Satellite Docking for the 16K Spectrum, and see if you can manouevre your space shuttle to match the spin of the satellite in order to dock and refurbish it

Subscribe to Popular Computing Weekly

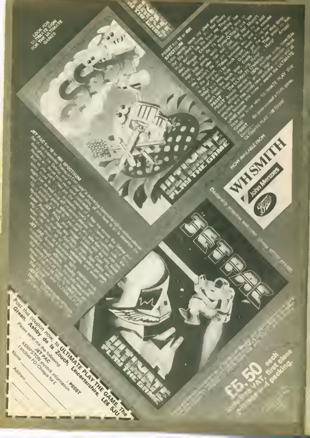
I would like to subscribe to *Popular Computing Weekly*
Please start my subscription from the ____ issue

UK Addresses ☐ 26 issues at £9 98 ☐ 52 issues at £19 95
Overseas Addresses ☐ 26 issues at £18 70 ☐ 52 issues at £37 40
Please tick relevant box
I enclose my cheque to *Popular Computing Weekly* for

Name ____

Address ____

Please send this form and cheque to *Popular Computing Weekly* Subscription Dept Hobhouse Court 19 Whitcomb Street London WC2 7HF



LOOK FOR THIS DESIGN FOR THE ULTIMATE GAMES
PSSST
JET PAC
ULTIMATE PLAY THE GAME
NOW AVAILABLE FROM
WH SMITH
John Menzies
Boots
£5.50 each
VAT, first class
packing.
Post this coupon now, to ULTIMATE PLAY THE GAME, The Green, Ashby de la Zouch, Leicestershire, LE6 5JU
Please send me the following
JET PAC / PSSST
KEMPSTON joystick information
I enclose PO/Cheque for £
Name
Address

Adam Colecovision

Continued from page 1

quality daisy wheel 80 column printer based on the Smith Corona TP-I printer which comes complete with a *Smart Writer* word processing software package built into Rom.

Adam's Basic is compatible with Applesoft and the machine comes complete with an arcade game — *Buck Rogers Planet of Zoom* — and a pair of joystick controllers.

Expansion options for the Adam include a 64K Ram pack, a further 500K storage drive, an expansion module making the Adam able to accept the full range of Atari VCS cartridges, and a further module giving the Adam CP/M compatibility.

Software for the Adam apart from Coleco's own Rom games developed for the Colecovision will include Logo, SmartBasic (a simplified Basic for young children) and a range of home management systems.

The $600 Adam computer system can be achieved in two ways: either by buying the Memory module, keyboard and printer outright or by first buying a Colecovision video games console and then adding what is called the Expansion module three, comprising the memory storage unit, keyboard and printer. Either way the result is the same — a complete system for around £400. In the US the price of the games console is $170 and the price of the expansion computer will be around $430.

The Colecovision games console has now gone on sale in this country, price £149. The add-on computer keyboard/printer Adam system and the all-in-one Adam system are both expected in the late autumn.

Computer fair

Continued from page 1

Video Technology's Laser 200.

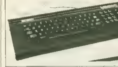
Computers showed its 96K version of the Lynx, together with a redesigned Alps disc drive, Centronics printer interface and joystick interface.

Dragon Data showed a prototype of its disc drive, a single half height 5¼-inch system with a formatted capacity of just over 184K.

Jupiter Cantab slashed the price of its Forth 3K Ace to £57.50 and announced an Ace 16+ machine with 19K for £89.95. Also of note, Mattel put its Aquarius machine on sale for the first time, available on the Silica Shop stand for £79.

On the software side, most new material had already been seen at either the recent ZX Microfair or Commodore Show. Consequently most of the new material was either for the Dragon or BBC machines.

Memotech emphasis is on expansion



MEMOTECH'S new MTX500 computer, launched at the Earl's Court Fair, places the emphasis firmly on flexibility and expansion.

The basic machine, costing £275, can be expanded more or less indefinitely to a system costing over £45,000.

The starter MTX500 is Z80A-based with 16K Rom, 32K user Ram and 16K video Ram. Rom includes MTX Basic with a built-in Z80 Assembler/Disassembler. Display is 16 colours with 40 columns and a 256 × 192 16 colour high-resolution graphics mode. There is a Sprite capability and eight independent virtual screens. A 3-channel sound synthesiser is built in. The professional style keyboard features separate numeric and function pads. Outputs include twin joystick, cassette, Centronics, tv, monitor, hi-fi and twin RS232 ports. There is also a Rom cartridge slot and a further uncommitted I/O port. Expansion options include user Ram expandable to 512K, an 80-column card, 5¼-inch and 8inch floppy discs, Winchester hard discs and up to eight 256K or 1M silicon discs. CP/M will be available. An 8-station Oxford Ring networking system is being developed and a 16-bit add on processor is in the pipeline. Then if desired, keeping all the peripherals, the MTX500 unit can be replaced by Memotech's up-market machine, the Orchid SM1.

All of which makes the MTX500 a machine that can grow from a home micro up to a complete business system.

Software for the MTX500 consists so far of a range of arcade games but more serious packages — word processing, accounting, filehandling — will follow. Other languages include a variant of Logo supplied as standard and Pascal available soon on Rom.

The MTX500 machine should be in the shops in the late Autumn with the Orchid SM1 to follow early in 1984.

Sinclair option on De Lorean

CLIVE Sinclair has purchased an option on the De Lorean sports car factory in Northern Ireland.

Sinclair, who has been developing an electric car in Winchester, hopes to use the site as an assembly plant. The Dunmurray based factory possesses one of the most advanced plastic moulding systems in Europe.

Talks between Sinclair and the Northern Ireland Industrial Development Board have been in progress since February. Details of the plan have not been released, but a Sinclair spokesman confirmed that Sir Clive has purchased an option to acquire a major portion of the assets of the De Lorean plant from the joint receivers.

The first prototype from the Sinclair Vehicle Project is not expected to be unveiled before 1985. However, it is no secret that Sinclair has been working on advanced battery technology with a view to developing the world's first mass produced electric car.

The Sinclair Vehicle Project is wholly owned by Sir Clive and the De Lorean deal will be financed by Sir Clive personally, not by Sinclair Research, his highly successful computer division.

Laser has coherent approach

THE latest micro to lay claim to be the cheapest colour computer is the Laser 200, manufactured by the Hong Kong company Video Technology and now being imported to this country.

At £69.95 the machine offers a Z80A processor with 16K Microsoft Basic, 4K Ram (expandable to 68K), nine colours, one sound channel and a Spectrum like keyboard. Display is 32 × 16 characters with two graphics modes — 64 × 32 with a colour resolution of 2 × 2 pixels and a high resolution mode of 128 × 64 with a choice of two sets of one background and four foreground colours.

The Laser features cassette port, tv output, monitor output, expansion and peripheral ports. There is an optional single-keyword entry facility.

The Laser 200 will be available in July. A 16K Ram expansion unit should be available at the same time for £29.95. August should see joysticks (£19.95 pair) and a Centronics interface (£19.95). A four colour printer (£149.95) and 64K Ram pack (£59.95) should follow in the autumn.



A range of Zimes educational and utility software will be available at launch — some 18 titles — with a further 17 titles at the end of the summer. All are on cassette priced at £3.95 (4K) and £4.95 (16K). Some UK software houses are also working on material including Abbex and Protek.



WINDOW ON ANOTHER WORLD
NEW RELEASES
STAR JAMMER — Wiping the sweat from my brow I searched the inky blackness ahead for signs of enemy fighters. Through Star Jammer was the best ship in the galaxy, my dwindling energy reserves made me doubt I could reach the next stargate. (One player space arcade game requiring one joystick)
SUPER SKILL HANGMAN Hangman as you've never played it before! A vocabulary of over 1000 words, three levels of difficulty and an optional timer make this classic word game a challenge for kids of all ages.
NIGHTFLIGHT — An accurate simulation of flying a single engine light aircraft. Nightflight allows for take off, landing and aerial manoeuvres including loops and rolls.
SALAMANDER GRAPHICS SYSTEM — A comprehensive picture drawing system for the home computer enthusiast. Pictures in any mode or colour set, text on the hi res screens and storage of pictures on tape. Requires one joystick.
ORIC TREK — A version of our classic Dragon Trek for the Oric 1. Ten levels of difficulty, three sizes of galaxy and more features than you can shake a Klingon at. A must for all Oric owners!
ORIC GAMES COMPENDIUM — Four exciting games for the whole family. Donkey Derby, Kingdom, Viper and Space Station.
DRAGON 32 and TANDY 32K (please specify)
Dragon Trek £9.95 Wizard War £7.95 Golf £7.95 Grand Prix £7.95 Vulcan Noughts & Crosses £7.95 Games Comp D1 £7.95 Salamander Graphics System £9.95 Super Skill Hangman £7.95 Star Jammer £7.95 Nightflight £7.95
BBC MODEL B
Dragon Rider £7.95 Tanks! £7.95 Games Comp B1 £8.95 Games Comp B3 £8.95 EDG Graphics (tape) £24.95 EDG Graphics (disc) £29.95
ORIC 1 Oric Trek £9.95 Games Comp 01 £7.95
NOW AVAILABLE AT MAJOR BRANCHES OF
Boots
AND
spectrum
Mail Order (add 50p p&p) and Catalogues (send SAE) from Dept C SALAMANDER SOFTWARE 27 Ditchling Rise Brighton East Sussex BN1 4QL Tel 0273 771942
Salamander Software

A small bug!

Congratulations and thank you to Paul Sellin for the fine adventure program for the Spectrum published over the last three weeks

Unfortunately I'm afraid a small bug has crept into it resulting in the map not being entirely accurate. The problem lies in the figure "10" at the bottom of the left-hand side of the map. Like the other figures this has a space printed after it and in the case of "10" this results in the main line of the map being printed one space too far to the right

I suggest the following corrections to line 9220 (I refer entirely to program line 9220 and to the lines within it as printed)

On line 2 put a space near the end before 12 (12)
On line 4 omit the space between the quotes
On line 4 add AT h - 1 8
On line 6 change x + 6 into x + 7

Once again thanks for a fascinating program and thanks too for an excellent magazine

Michael Kirkland
20 Batey Avenue
Rainhill
Prescot
Merseyside L35 8LT

Prompt and polite

I had a 16K ZX Spectrum and I decided to upgrade it to 48K. I looked in all the computer magazines that I read and saw an upgrade in the classified advertisements at the back of your magazine that I thought offered good value

I sent off the money for the upgrade kit and four days later it arrived. I got someone I know who repairs computers to install it for me. Unfortunately the extra memory did not work. He gave the kit back to me and told me to return it and get a replacement

I sent off a letter with the chips explaining the situation. Four days later I received the replacements and a letter of apology. The letter also said that the original chips were being tested and if they were found to be faulty they would refund postage. They also said that if the chips that were sent as replacements were faulty I was to send off the machine with the chips and they would insert them without any extra cost as they normally do. The replacements did not work properly, so I packed the Spectrum in its box and sent it back with the chips and another letter

Seven days later, I got it back through the post with a letter explaining that although the chips were tested and found to be in perfect working order the sockets in the computer to receive them didn't work. They sent back the sockets and even though they did not usually do repairs they fitted the chips at no extra cost, directly on to the circuit board. I was told that they hoped that this would in no way prevent me from doing business with them in future

I would like to thank J C Brewer and the company's representative who sent the letter for prompt polite service. Also, I would like to say that I will certainly turn to them in future if need be as I was so impressed with their service

Peter Martitsch
11 Bengairn Street
Haghill
Glasgow G31 3OR

Nice to hear of a company being praised for doing something right. Congratulations to J C Brewer are in order

Disconnected ear!

Here is a tip which your readers may find useful

I was fed up with constantly pulling out the Ear plug on my cassette recorder when saving programs from my Spectrum until I came up with a solution which works really well and enables both Ear and Mic plugs to be left in at all times

I fitted a lever operated micro switch (Subminiature SPDT lever switch from Tandy — price 89p) inside the recorder case so that it was operated when the record button was pressed. Using the two outer connections I wired it up in series with the Ear socket so that in the record mode the Ear socket is disconnected. Only the inner pin of the Ear socket is disconnected the outer (screened) pin does not matter

This simple inexpensive modification has proved very effective and easy to fit and use

Barry Ashfield
37 Cottesmore Road
Hessle
North Humberside

Threatening to leave!

Having just read your adventure column in Vol 2 No 22 where you say "ask a friend to help" in *The Hobbit* I feel I must ask more than this

No doubt we all asked for help and received the reply "ask a friend" and no doubt we all decoded the clue telling us to be carried but all efforts to get through the window are failing

My wife is threatening to leave, my kids are begging me to play, the car is due for a service, the house needs painting and my boss wonders why I sit staring into space

Please help me get out of the Goblin's Dungeon before the Spectrum is tested for its aerodynamic qualities across our lounge!

Roger Spurr
3 Bacchus Way
Morton
Derbyshire DE4 3AG

Without giving too much away, your problem will be eased if you first open the aforementioned window

Is it gobbledygook?

I am in the process of preparing some material relating to the uses and abuses of micro computers generally and to the crazy things they say in microcomputer manuals specifically. If any of your readers has a relevant funny story or can point to specific instances of gobbledygook in manuals I'd be delighted to hear from them

Michael Thorne
Computing Mathematics Dept
Mathematics Institute
Senghennydd Road
Cardiff CF2 4AG

Tracing information . . .

The Sinclair Spectrum needs a *Trace* command to print program line numbers variables etc as each one is executed by the computer, a useful aid to debugging

My method makes use of the printer, as I find that printing *Trace* information on the screen leads to confusion. By setting a 'switch' at the start of the program you can turn the *Trace* on or off

Here is the system applied to the program on page 38 of the *Spectrum Manual*

L V Phillips
17 Elizabeth Ave
Ibstock
Leicester LE6 1NG

```
   1 LET TRACE=1  REM The switch
'on', to use trace. To turn off
the trace make this line
     LET TRACE=0
 100 LET x=10: IF trace THEN PRI
NT #3,x: REM This will give the
value of the variable.
 110 GO SUB 600
 120 IF TRACE THEN PRINT #3,"L12
0": PRINT s
 130 LET x=x+4
 140 GO SUB 600
 150 IF TRACE THEN PRINT #3,"L15
0": PRINT s
 160 LET x=x+2
 170 GO SUB 600
 180 IF TRACE THEN PRINT #3,"L18
0": PRINT s
 190 STOP
 500 IF TRACE THEN PRINT #3,"L50
0": LET s=0       REM The 'L' to
indicate line number rather than
variable value.
 510 FOR y=1 TO x
 520 LET s=s+y
 530 NEXT y
 540 RETURN
```


STARTECH
Absolutely the lowest prices!

A NEW LOW PRICE FROM
FOX ELECTRONICS
SPECTRUM UPGRADES
ONLY £21.00

INCLUSIVE (Issue 2 machines only)

A high quality kit at a new low, low price which simply plugs into existing socket within your Spectrum, no soldering is required and step by step instructions are supplied.

PROBABLY THE BEST KIT AVAILABLE AT DEFINITELY THE LOWEST PRICE

Should you require any more information on the kit or any other items, please phone or write to us at the address below.

Also available for both the
SPECTRUM OR ZX81
The FD42 Keyboard A keyboard to house your Spectrum/ZX81 PCB and give you a full typewriter type keyboard, no soldering or electronic knowledge required to fit
Only **£29.95** inclusive

And for the Spectrum only the Spectrum Echo an amplifier with a tape switching interface giving you the facility to save and load without switching leads Also incorporates a cueing facility for easy location of programs
Only **£19.99** inclusive

ZX81 **ZX81** **ZX81** **ZX81**

A replacement keyboard — this one with a calculator type feel Peel off backing and press to fit Incredibly low price of £10.00 p&p included

ZX81 **ZX81** **ZX81** **ZX81**

VIC20

More memory for your VIC20
Vixen RAM Cartridge for the VIC20

Switchable between 16K or 8K + 3K
Gives you the option of full 16K RAM or 8K and 3K RAM in one package When added to a Standard VIC20 gives 16384 bytes of extra memory in memory blocks 1 and 2 or 4092 bytes of extra memory into the 3K memory block AND 8192 bytes of extra memory switchable between memory blocks 1 and 3
Fully compatible with available motherboards modules
Simply plugs into the rear expansion port of computer
No re addressing of existing BASIC programs needed

Only £39.95 Inclusive

VIC20

A high quality light pen which plugs straight into your Vic with no special interface needed **£20.00** inc of soft ware + p&p

SEND NOW TO FOX ELECTRONICS
141 ABBEY ROAD, BASINGSTOKE HANTS.
Tel 0256 20671

VISA

PLEASE SEND ME
SPECTRUM UPGRADE ☐
SPECTRUM KEYBOARD ☐
SPECTRUM ECHO ☐
ZX81 FD42 KEYBOARD ☐
ZX81 PRESS ON KEYBOARD ☐
VIXEN RAM CARTRIDGE ☐
VIC LIGHT PEN
Name
Address

Fun Fair

A new game for the 16K Spectrum by Jack Knight

Inspiration for this game comes from the fairground from the booth where the punter pops ping pong balls into the open mouth of a mock clown to score on a table below

That is the inspiration But with the power of the micro (in this program the Spectrum) the simple gamble is built into a sophisticated trial of agility of fingers and quickness of eye However the smell of the fairground is still there — the opening includes a snatch of fairground-organ music and the scene is the barker s booth

The ball has become a bubble blown at random from a multi-headed blower which moves irregularly up and down its column at one side of the booth At the opposite side of the booth is the clown face peeping from behind the curtain his mouth open for catching Up and down he moves trying to follow the blower manipulated from behind the scenes by the player

When you play watch out for what happens when the clown does catch a bubble in his mouth The bubble may (or may not) drift as it nears the end of its journey — just when you thought you had it in line for catching If that were not enough every 10 bubbles (with a tinkling of sound preceded by a warning beep) the multi headed blower moves closer Then try to keep pace with it!

For your 10p you get a generous 50 bubbles to beat the previous score

The opening gives just enough guidance for a newcomer to play He she is directed to *Inkey$* 6 and 7 to move the clown and is warned about bubble drift The pause for reading is masked and enlivened by a simulation of fairground music which also helps to create the atmosphere

The following scene-setting section cre-

ates the booth The left-hand margin is used for score and high score

In the main routine *User* graphics create the multi-headed blower and the head of the clown In contrast the 0 sign makes as passable an imitation of a bubble as could be hoped for

The appearance of variable *k* twice in the main routine may be a puzzle Its purpose is to switch the loop from driving the blower and the clown to blowing the bubble across the screen whilst still continuing to allow movement of the clown's head

In the next level section a new blower column is made to appear, so the blower can move nearer to the clown

Musical chords mark the closing with more than a pinch of flash "Another go?" is the invitation If taken up, the player is not subjected to the opening again Also as *Cls* would lead to the tedium of a repeat of the sets stage sub-routine selective clearing is used mainly by *For Next* loops Note with line 750 the penultimate print is two spaces wide

With the graphics decimal numbers rather than binary have been used to make it easier for you to type in The graphic of the clown's lips has been confined to one square so that the red *ink* can be picked up by *Attr* to establish a bubble has been caught ■

2000 FOR F=USR "A" TO "E"+7
2010 READ A : POKE F,A
2020 NEXT F
2050 DATA 3,7,15,31,31,31 15, 5, 5, 15, 63 etc (no leads)

```
  10 REM **FUN-FRIA** © by JACK
     KNIGHT
  82 LET m=0
  90 GO TO 2000
  99 REM *BLOWER* (NB "GRAPHICS"
+E*3)
 100 PRINT AT d,i," ",AT d+1,i,"
█",AT d+2,i,"█",AT d+3,i,"█",AT
d+4,i," "
 110 LET c=INT (RND*7): LET f=IN
T (RND*3)
 120 IF d=15 OR d=3 OR c=5 THEN
LET dd=-dd
 130 LET d=d+dd
 140 IF c=5 AND f=1 THEN LET l=d
-dd+g: GO TO 270
 199 REM *CLOWN* (NB "GRAPHICS"+
A,B,C,D)
 210 LET a=a+(INKEY$="6" AND a<=
14)-(INKEY$="7" AND a>=2)
 220 PRINT ; INK 7;AT a,30," ";A
T a+1,30,"█",AT a+2,30,"█"; INK
2;AT a+3,30,"J"; INK 7;AT a+4,30
,"█",AT a+5,30," "
 250 IF k=0 THEN GO TO 100
 259 REM *BUBBLE*
 270 IF e=29 THEN GO TO 400
 280 IF l=15 OR l=4 THEN LET b=0
 290 IF a=25 THEN PRINT AT l,e,"
 ": LET l=l+b
 300 LET k=1
 310 PRINT ; INK 7;AT l,e," 0"
 320 LET e=e+1
 330 GO TO 210
 399 REM *BURST OR GULPED*
 400 IF ATTR (l,e+1)=10 THEN PRI
NT ; INK 7;AT l,e," 0": BEEP .1,
20: PRINT ; INK 2;AT l,e+1,"J":
LET s=s+5: PRINT AT 12,1,s
 410 IF ATTR (l,e+1)<>10 THEN BE
EP .1,-20: PRINT AT l,e," "
 420 LET j=j+1
 430 IF j=10 OR j=20 OR j=30 OR
j=40 THEN GO TO 500
 435 IF j=50 THEN GO TO 600
 445 GO TO 1100
 499 REM *NEXT LEVEL*
 500 PRINT AT d,i," ",AT d+1,i,"
 ",AT d+2,i," ",AT d+3,i," ",AT
d+4,i," "
 505 BEEP .5,0
 510 LET i=i+3
 515 FOR n=1 TO 20: PRINT AT n,i
-1,"█": BEEP .01,10+n: NEXT n
 520 GO TO 1100
 599 REM *CLOSING*
 600 BEEP .5,0
 610 FOR n=1 TO 3: FOR p=6 TO 1
STEP -1: BORDER p: BEEP .1,10+p
: BEEP .1,10-p: NEXT p: NEXT n
 699 REM *NEW GAME*
 700 PRINT ; INVERSE 1; FLASH 1;
AT 3,10,"ANOTHER GO SIR/MADAM?",
AT 6,14; INVERSE 0; FLASH 0;"PRE
SS ""ENTER"""
 710 IF INKEY$=CHR$ 13 THEN GO T
O 730
 720 GO TO 710
 730 IF s>m THEN LET m=s: PRINT
AT 7,1;m
 740 PRINT AT 12,1,"   "
 750 FOR n=1 TO 20: PRINT AT n,1
0," ",AT n,15;" ",AT n,18," ",AT
 n,21," ",AT n,30,"  ": NEXT n
 760 FOR n=10 TO 30: PRINT AT 3,
n," ",AT 6,n," ": NEXT n
 770 GO TO 1000
 999 REM *ASSIGNS VARIABLES*
1000 LET dd=1
1050 LET d=4
1060 LET s=0
1070 LET a=1
1080 LET i=10
1090 LET j=0
1100 LET g=INT (RND*3+1)
1200 LET e=i+1
1300 LET b=INT (RND*3+1)
1400 IF b=2 THEN LET b=-1
1500 IF b=3 THEN LET b=0
1600 LET k=0
1700 GO TO 100
1999 REM *GRAPHICS*
2000 FOR n=1 TO 5
2100 READ a$
2200 FOR p=0 TO 7
2300 READ q: POKE USR a$+p,q
2400 NEXT p
2500 NEXT n
2800 DATA "A",3,7,15,31,31,31,15
,5,"B",5,15,63,127,127,63,15,15,
"C",31,31,3,3,3,3,31,31,"D",15,1
5,7,7,0,0,0,0,"E",63,126,252,252
,252,252,126,63
2999 REM *OPENING*
3000 BORDER 1: INK 6: PAPER 1: C
LS
3100 PRINT ; INVERSE 1;AT 2,0;"*
*FUN-FAIR**"; INVERSE 0;''TAB
 1;"CATCH BUBBLE IN CLOWN'S MOUT
H"''TAB 6;"BY USING ""6"" OR ""7
"""''TAB 3;"BEWARE - BUBBLE MA
Y DRIFT!"
3200 LET r=10: FOR n=1 TO 3: BEE
P .4,1: BEEP .2,r: PAUSE r: BEEP
 .2,r: PAUSE r: BEEP .4,-4: BEEP
 .2,5: PAUSE r: BEEP .2,5: PAUSE
 r: NEXT n
3300 CLS
3999 REM *SETS STAGE*
4000 PRINT AT 4,0;"HIGH",AT 5,0;
"SCORE",AT 10,0;"SCORE"
4100 FOR n=9 TO 31: PRINT AT 0,n
,"W",AT 21,n,"█": NEXT n
4200 FOR n=1 TO 20: PRINT AT n,9
,"█",AT n,31,"M": NEXT n
4300 GO TO 1000
```

USR "A",10

2000
2100

Life in the fast lane

***David Kelly** talks to John Ritman author of Artic's 3D Combat Zone*

Step inside any arcade these days and you will see things have come a long way since the first *Pong* tennis game

A major preoccupation now is simulations of 3-dimensional effects — perspective changes, panning landscapes, all in full colour and sound Look at Atari's recent *Pole Position* Grand Prix race game or the *Zaxxon* space race

For home computer programmers intent on recreating the thrills of the coin-ops in your own home these simulations present an enormous challenge

3D Combat Zone by John Ritman of Artic is a recent attempt to produce true 3D effects on the Spectrum You are in command of a tank, looking forward through the tank windows out onto the battle field You can move forward backward left and right — and as you move the landscape grows or recedes

This kind of interactive 3D graphics has never been achieved before on one of the low cost micros The quality of representation and detail are limited by the Spectrum and the landscape and tanks are represented by simple line shapes

The reason is simple — how do you make the Spectrum fast enough to draw at the sort of speed needed for a challenging real time simulation?

John is a 26-year-old who failed maths O level twice After becoming a field tv engineer he became interested in computers when his company began to look at the possibility of renting out micros with tvs He thought he ought to know a bit about it and in January 1982 he bought a ZX81 A week later he bought a Ram pack and three months on, he had taught himself machine code "I couldn't stop playing with the ZX81 he explains

John actually reckons that machine-code is easier to learn than Basic "In machine code there are only a very limited number of functions and it is easy to understand each in completeness '

The first program that John wrote was *Namtir Raiders* — a multiple-wave Space Invaders game for the ZX81 In May last year he sent it in to Artic and rather to his surprise he was rung up by Artic's Richard Turner who accepted it At the same time Richard Turner suggested that John should write for the Spectrum which had been launched the previous month

To begin with John found the Spectrum difficult to work with Programming on the ZX81 he had found an assembler to be an essential tool — and there wasn't one at the time available for the Spectrum

An assembler offers a sort of half way house between a high level language like Basic and machine code It has some of the understandibility of Basic — it has loops and labels for example But the resultant code — the so-called source-code — can be easily translated or assembled into machine-code — the so-called object code

"You have really got to write using an assembler says John Keying in the code direct you get too many possible errors It only needs one mistake in hex and you have got a crash

Machine code is rather like writing in Basic where there are only eight usable locations or registers

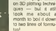
The neceeeary speed

Nearly the whole of machine code is just loading and saving commands — information is plucked from a particular memory location into one of the eight registers and then saved into a different memory location Because the screen is memory mapped each point on the screen corresponds to a particular memory location and by loading and saving things can be moved on the screen

While he was waiting for an assembler, John kicked around his idea for a 3D tank simulation game But when he finally got one — Artic's own — he put the 3D game aside to write *Cosmic Debris* an *Asteroids* type game "I knew that the biggest problem with a 3D simulation would be speed — so I experimented first with *Cosmic Debris*

The Spectrum prints in 8 × 8 pixel blocks To avoid the space craft or asteroids jumping in steps of eight pixels John designed eight sets of characters each one with the graphics shapes offset by one pixel from the last Then by printing each of the eight characters in turn the illusion of smooth movement is created

Writing *Cosmic Debris* sorted out many of the graphics techniques needed for a 3D simulation "The only thing I had no idea about was the maths for rotations in 3D *Practical Computing* came out with a 4 page article on 3D plotting techniques — but it still took me about a month to boil it down to two lines of formulas!





John then became convinced that there was no way that a 3D simulation was possible on the Spectrum because of the speed neccessary He wrote his 3D tank game in Basic first and the computer took five seconds to update the screen each time to show the new positions

A new approach was called for First John created a different memory map for the Spectrum including a new hidden dot programmable high resolution screen With the finished version of *3D Combat Zone* the Spectrum really is going at full pelt It draws each move on the hidden hi res screen — taking about half a second — and then bulk downloads it to the main screen — what you see — in about an eighth of a second This is how *3D Combat Zone* gets round the problem of jerky movement on the Spectrum

If Sinclair had incorporated a proper switchable high-resolution screen in the Spectrum in the first place it would have saved me a lot of effort explains John

He uses a series of algorithms to work out each new frame of the simulation On the high resolution screen only the minimum number of points are plotted in order to save time These are then joined up to make the shape of the tank and the pyramids The only positions worked out are the corners so for example, the tank is made up of two distorted cubes involving the manipulation of only 16 points to make the tank move The rotation is effected by the computer applying sine and cosine functions from a table to the points on the screen Distance is achieved by dividing the up/down and left right dimensions of a given shape by a factor which represents its distance *into* the screen

So far John's 3D Tank game is the only one of its type and he is keen to stay ahead of his competitors 'The way I programmed it means that it is not as accurate as I would like What I am working on now is a series of 3D algorithms that incorporate floating point arithmetic That would make any future 3D games much more accurate

He is currently working on a game with spiralling eggs which hatch into hostile birds He says "Fast graphics is what I am good at and I now find programming quite easy It is getting the idea for a good game in the first place that is difficult ●

The ultimate horror!

***Tony Bridge** finds that there are hidden perils in being a software reviewer*

Anxpyth Grand Admiral of Emperor Haile Debeus 7th Space Fleet (Alien Contact and Subjugation) 'Gentlemen here before you is what Earthmen laughingly refer to as a Software Reviewer — weird name I grant you, but his job is to judge the effectiveness of these so-called ' games An innocent name for a sinister method of indoctrinating a large part of Earth s population to resist our attacks — I mean our show of friendship in the cause of cultural exchange!

During several centuries the population has largely devoted its time to killing each other — now however a new religion appears to have sprung up Many now worship a common blood relative one Uncle Clive who promises many strange and wonderful things His followers sit and pray before what they call a Spectrum which seems to be a wondrous artefact [He waves a tentacle toward a blob of protoplasm] Lieutenant Snaxthpool throw the Brain Scanner switch let us see what this reviewer has to tell us!

Tony Bridge (for it is he!) I won t tell you anything you overgrown lump of aaaahhhh! What do you want to know Master?

Anxpyth That s better miserable being! Let us know of these Zapping games — and be quick we have no time for your ramblings

Tony Bridge (whining) "Yes Master

Well the Spectrum has been with us now for only a year yet in that time the software available for it has improved beyond all recognition from the early ICL/Sinclair days At the price of the machine recently cut to below £100 for the smaller memory and the average price of cassettes £5-6 there is no software in the world to compare [a low rumble from *Anxpyth*] Humble apologies Sire I'll get on with it now'

First a major disappointment in Imagine s follow-up to *Arcadia* which will remain one of the classic Spectrum games Whilst the graphics of *Schizoids* are astonishing, even though they are in black and white the game mechanics unfortunately do not measure up You are the pilot of a space refuse vessel and are trying to shove strange alien shapes into a nearby Black Hole The 3D graphics are as I've said superb but the game has no high score facility and only a nod towards more difficult levels Thus any addictiveness is destroyed I ve had this game a month now, and played it twice — not good value

If you re looking for the successor to *Arcadia* look no further than *Black Hole* from Quest Software (although see remarks later in this review on Imagine s other new releases) This is what many people may have expected from *Schizoids* and is in fact a combination of *Schizoids* and *Arcadia* Your starship (well it does look like a star) has to fire across the screen (rather than up which makes a change) at a selection of alien spaceships emanating from a Black Hole — thus making nonsense of current scientific theory (except the Walt Disney Theory of Multiple Returns!)

You have a choice of weapons — a short range straight-firing cannon or a couple of longer range torpedoes which are, however bent by the gravity well around the Black Hole so that aiming is a bit of a hit and miss affair (excuse the pun!) Getting in the way of your ship are all the wonderful shapes from the *Arcadia* stable — spinning wheels falling nails and so on Collide with one and you are spread across the Galaxy Although a little plagiaristic this program has beautiful graphics, and the requisite addictiveness

The Arcadian is the name of the latest collection from the software house of J K Greye This company has been looking belatedly for a new Malcolm (Mr 3D) Evans since he left to start New Generation Software This tape is a collection of four games plus a menu *Invasion* is *Invaders* of course, and *Kamikaze* is *Scramble* *UFO* is an asteroid-avoiding game à la those early ZX81 games while the only original one on the tape is *Minefield* This game has you laying mines in a forest Step on the trail you ve already laid and you blow up Really this tape is a collection of ZX81 1K programs with added colour and (not very imaginative) hi res graphics Definitely not good value!

Speaking of Malcolm Evans he has a couple of new programs the first being *3D Tunnel* Most of you have probably seen this now but in case you have taken to your fallout shelter already this one takes place in a tunnel (OK so it s pretty obvious!), that constantly winds rises and falls as it snakes along You are rushing down it, and have to zap the various fauna that come bounding towards you

You ll see frogs rats spiders and bats on the various levels and if you have the larger memory the ultimate horror a London Underground tube train! No you can t shoot that you can only press yourself against the wall and goggle in amazement as it rushes past you!

Twist and turn in any direction

3D Man s new release *Knot in 3D* (but it definitely is!) must be one of the most beautiful, graphically to be seen on the Spectrum Like all good programs the idea is very simple — imagine yourself in a cube of unoccupied white space You are rushing along at breakneck speed and a trail of green and yellow light is left behind you From nowhere appear at intervals, great blocks of magenta and blue described on the cassette inlay as Chasers although they don t chase at all

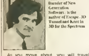
You can twist and turn in any direction to avoid the Chasers (and a joystick may be used as an alternative to the keyboard) but you must also avoid your own trail Sounds easy but as the space gradually fills up with varicoloured trails your manoeuvring becomes ever more frantic The whole effect becomes rather like rushing down narrow streets with tall skyscrapers on either side and sudden dead ends

The object is to fill as much of the space as possible before the final collision (you re allowed 18) The scenario on the cassette inlay is rather confusing and nobody I know who has seen the game has the faintest idea what it s all about or the strategy to employ It is though the most astounding thing you ll see for a long time

Etx is the latest program from Abbex, the Games People (sic) Of course, the main protagonist here can t be confused with the main character of the film of the same — whoops! — nearly the same name This one is a little three-foot crea ture with a long neck and bug eyes, not at all like the other one

Etx s aim is to find bits of a telephone which he can then use to phone home Why does that phrase sound familiar? A large matrix of deep pits has to be sear ched by the little creature in order to find all the components along with various trea sures that will help to boost the final score

The graphics are superb almost sprite-like and well up to Atari standard 48Kers will have the added feature of speech — although this sounded to me as if the Spectrum had succumbed to a bad case of laryngitis



Malcolm Evans, founder of New Generation Software, is the author of Escape 3D Tunnel and Knot in 3D for the Spectrum

As you move about you will travel through many zones in which you can do one of several things You may for inst ance only call your mothership when standing in a certain spot and you will need the complete phone All this time you will be harrassed by certain mean people like the Professor who will whip you back to his lab for a quick experiment You have a friend in Elliott who will come to your rescue if you are lucky Not a bad little arcade game, and good value for money

Now we come to *Android One* from Vortex Software The game is one of those guaranteed to keep you sitting bleary-eyed in front of your TV screen until 3 o clock in the morning You are in control of the android in the title whose mission is to enter a nuclear power station and neutralise the core, which has become unstable Racing against the clock you must battle your way through the tortuous corridors fighting all the while the guar dians of the power station

These little horrors take several forms — some come after you whilst others just bounce up and down blocking your prog ress Touch any of them and you ll lose a life but you do have a laser and a limited number of force fields for dire emergency As with most of the good games in the present batch movement may be effected either from the keyboard or by (Kempston) joystick Humour (in the android s facial expressions) and suspense combine with fantastic graphics to make an excellent arcade game

Jetpac written by Ultimate Play The Game (yes you did read that right!) is yet another extremely tough and addictive game This time you are an intrepid inter stellar trader and your job is frankly plundering innocent planets of their gold and other riches Starting off on the first planet you must first assemble your spaceship from the bits scattered around and then re fuel using the fuel tanks dropped to you by some unseen be-nefactor in the sky You can also pick up the treasures such as bars of gold and isotopes

All this time the understandably irrit-able natives are trying to get their own back on you You may use your jetpack which is strapped to your back to hover in mid-air and your laser to zap the aliens In true arcade style each level presents you with evermore vicious aliens The graphics again are sensational

Another new alien zap game is *Spawn of Evil*, from DK Tronics [get their address *Snaxthpool* they ll pay for this!] A rather complicated scenario and instruction prog ram is loaded before the main program What it all boils down to is that you can get the little blighters as they are spawned — if you re skilful! Switch to your Galaxy Scan ner (lucky you!) and see the various spawning grounds Move your ship to a trouble spot and switch to *Fire* mode

Newly born aliens are plentiful and re latively easier to hit — however you don t score so highly for getting them If you feel lucky you can wait for them to join together into larger creatures Now you score much more for hitting them but of course it gets harder to do so and now they fire back Movement is inertial that is it takes some time to accelerate to speed and more time to decelerate before a change of direction may be made

Continued on next page

Firm	Program	Price
Abbex 20 Ashley Court Great Northway London NW4	*ETX*	£5 95
DK Tronics 23 Sussex Road Gorleston Gt Yarmouth Norfolk	*Spawn of Evil*	£4 95
Imagine Masons Buildings Exchange Street East Liverpool Merseyside L2 3PN	*Schizoids* *Molar Maul* *Ah Diddums*	£5 50 £5 50 £5 50
J K Greye Enterprises 16 Park Street Bath BA1 2TE	*The Arcadian*	£4 95
New Generation Software Freepost BS3433 Oldland Common Bristol BS15 6BR	*3D Tunnel* *Knot in 3D*	£5 95 £5 95
Quest 119 The Promenade Cheltenham Gloucestershire GL50 1NW	*The Black Hole*	£5 50
Ultimate Play The Game The Green Ashby de la Zouch Leicestershire LE6 5JU	*Jetpac*	£5 50
Vortex Software 28 Crawford Road Hatfield Herts AL10 0PG	*Android One*	£5 95



The game is a little too subtle for its own good. While one can appreciate the programming skill that has been lavished on it, it is like the similar *Timegate* ultimately boring.

At last the games we've been promised from Imagine have arrived. This company launched on a wave of very high-powered advertising, has gained an unfortunate reputation for delay — a requisite in the computer world maybe but exasperating all the same. Thankfully the wait has been well worth it.

Molar Maul rewrites the history of dental science. Hands up all those of you who enjoy a visit to the dentist. Well the rest of us can now fight back with Magico toothpaste which contains the wonder ingredient DKX 11. This combats the dreaded bacteria Dentorium Kamikazium the DK. These little blighters attack your teeth and being immortal keep on coming. Luckily you have supplies of Magico and this will restore your teeth to good health.

The screen consists of a wide-open mouth complete with tonsils in the middle from which issue the dreaded DKs. You control a toothbrush which you can charge with a dollop of Magico from the conveniently-situated tube. Then scrub for dear life as the DKs start in on your teeth. Each squirt of toothpaste lasts for a couple of scrubs only and the brush has to be recharged frequently. You have limitless amounts of Magico and three brushes.

This is like all good arcade games completely dotty but the great graphics and Atari-like fairground musical make it a game that will be around for a long time.

Ah Diddums (*Snaxthpool* the Earthman is raving — your interrogation methods may need revising!) is the other game from Imagine and has another dotty scenario. Mummy and Daddy have left the light on in the nursery so that Baby won't cry (all together now Ah Diddums!) The toys are happy because they can play. Teddy however wants to comfort Baby and so tries to build a staircase out of the toybox using Baby's bricks. The other toys knowing that if Baby stops crying the lights will be turned off thus stopping their playtime try and stop Teddy from climbing out.

So Teddy's in for a tough time with toy soldiers firing at him, giant lumps of plasticine trying to roll him flat and rattles on the rampage. He's not entirely helpless luckily as he can pick up a peashooter and fire at the enemy toys. He can also roll balls at them or place dolly boots in their way. There is also the ultimate weapon the Jack-in-the-box! Another highly original game from Imagine and very good value.

Grand Admiral Anxpyth Snaxthpool I think we can give this solar system a miss! The natives seem to be in an advanced stage of total insanity — either gibbering about psychotic toys or zapping aliens!"

So as I was saying the software for the Spectrum is improving daily. While the consumer should beware the many misleading claims being made for software in the current war of colour advertising he may also be reasonably sure that most of the arcade games have to come up to a certain (good) standard to survive. A bright future is ahead for Spectrum games players. ■

No strings attached

***Bob Skinner** explains some of the advantages in using string arrays in programs*

Arrays or dimensions are probably the first main stumbling block for any programmer They are also one of the most useful and widely used methods for handling data in memory *Read* and *Data* are important tools but arrays are far easier to manipulate

Basic supports two types of arrays numeric and string Numeric arrays can only hold numbers string arrays hold characters (which means that you can use them for numbers with *Str$* and *Val*)

Here we shall deal with string arrays, as these are most useful Besides numeric array handling is almost identical

To "set-up" an array you use the reserved word *Dim* You must also give this word parameters which refer to the size of the array you want to use Such parameters are known as "subscripts and allow you to fill and access the information in the array at will

It is easiest to imagine arrays in the form of *Rows* and *Columns* whose intersections provide *Cells* which can hold information rather like pigeon-holes Arrays can have one or more rows and one or more columns A single dimension string array with four columns can be represented as in Fig 1

Fig 1

	COL1	COL2	COL3	COL4
ROW 1				

To create such an array in Ram we need to give the array a name *Ar$* for example also its size 4 (columns — 1 row is assumed) like this

```
10 DIM AR$(4)
```

This particular *Dim* statement could only be used once in a program though you can set up as many arrays as there are room for in Ram That is you cannot alter the number of rows or columns once the array has been *Dimensioned*

To set up arrays with more than 1 row you need to use two subscripts row and column in that order So to get an array *Ar$* with 3 rows by 5 columns, we simply amend the command line to

```
10 DIM AR$ (3 5)
```

This will set up an array like this

	COL1	COL2	COL3	COL4	COL5
ROW 1					
ROW 2					
ROW 3					

Such an array is called a 2-dimensional string array You can set up 3-dimensional arrays in some dialects of Basic with statements like *Dim Ar$*(3 5 7) but this is beyond the scope of this article

Each cell of a strong array can hold up to 255 characters — like a normal string but check this in your machine's user manual To put information into the array you simply use statements like

```
20 AR$(1 1) = HELLO
```

This puts the word *Hello* into the cell of *Ar$* which is referenced by the subscripts 1 1 — ie. row 1 column 1 The following example should make this clear

```
10 DIM AR$(3 5)
20 AR$(1 1) = FILLING
30 AR$(2 3) = AN
40 AR$(3,2) = ARRAY"
```

This gives

	COL1	COL2	COL3	COL4	COL5
ROW 1	FILLING				
ROW 2			AN		
ROW 3		ARRAY			

To get the information out, you can simply use *Print* as in

```
50 PRINT AR$(1 1)
```

which will display the contents of the cell specified Or you can assign the contents of a cell to a simple variable as in

```
60 LET A$ = AR$(2,3)
```

To use numbers in string arrays first convert the number to its string representation

```
100 X = 98
110 X$ = STR$(X)
120 AR$(3 5) = X$
```

To get numbers out, reverse the process using *Val*

```
200 X = VAL(AR$(3 2))
```

At this point, it should be obvious that to access a given row we can use a *For Next* loop to put information in or get it out Thus in our example, if we wanted to see the contents of the cells of row 2 we would write

```
400 FOR C = 1 TO 5
410 PRINT AR$(2 C)
420 NEXT
```

We don't want to have to write this for every row so we embed this loop in another

```
390 FOR R = 1 TO 3
                              INNER LOOP
430 NEXT
```

so that the program repeats the above for all rows

```
390 FOR R = 1 TO 3 for all rows
400 FOR C = 1 TO 5 for all columns
410 PRINT AR$(R C) print the contents of the cell
420 NEXT C next column
430 NEXT R next row
```

A similar technique can be used to fill the cells with information

Continued on next page

Fig 2

START
ESTABLISH FIELD TO SEARCH
ESTABLISH WHAT TO SEARCH FOR
CHECK FIELD in CURRENT ROW
ITEM FOUND?
YES
DISPLAY ALL ITEMS IN ROW
(call sub-routine)
(NO)
ALL ROWS SEARCHED?
YES
EXIT TO START WITH APPROPRIATE MESSAGE
NO
UPDATE ROW
GO NEXT CHECK

A string array can be used to set up a simple database which can be sorted, searched etc For example we can set up an array to hold names (col1), addresses (col 2) and phone numbers (col 3) to act as an address book

The simplest way to get the data into the array is by using *Read* and *Data* statements although you could have the program ask the user for the information The *Data* statements will take the general form line no *Data* name address phone no For example

```
9000 DATA PETER JONES 13 HIGH STREET
     NEWTOWN 0213-415
9010 DATA MARY PHILLIPS 26 BROADWAY OLD-
     TOWN 098-5647
```

Notice that you cannot put commas into the addresses or you will have problems as the Basic Interpreter will think each comma ends a data field *Reading* this data into the array now simply requires some variables eg the number of rows and columns and a loop structure like the previous one If we have 100 names, addresses and phone numbers the program will start like this

```
10 NR = 100 number of rows
20 NC = 3 number of columns
30 DIM AR$(NR,NC) set up array
40 FOR R = 1 TO NR for all rows
50 FOR C = 1 TO NC for all columns
60 READ AR$(R C) READ a string and put it into a
   cell
70 NEXT C do the next column
80 NEXT R do the next row
```

Line 80 could be written

```
60 READ A$ LET AR$(R C) = A$
```

but this is unnecessarily complicated

All that remains is to design a program to access the information in the array To do this we must first decide exactly what we require in terms of "user-usefulness" The user will certainly want to be able to search the database for a given name in order to find an address or phone number, so we will concentrate on this first

It is relatively easy to also include a facility to search any of the "fields" or columns (name address or phone number) as well since such searches will be based on the same principles as a search by name alone The flowchart is shown in Fig 2

Coding this algorithm is now a simple job — this is usually the case once a flowchart describing the procedure has been designed

The following fragment of code caters for the "Establish which field to search" and "Establish what to search for" blocks of Fig 2

```
90 CN$ = "NAPE" used to check input
100 CLS clear screen
110 PRINT "N NAME
120 PRINT "A ADDRESS                MENU
130 PRINT "P PHONE
140 PRINT "E END
150 PRINT blank line
160 PRINT "PRESS THE LETTER OF YOUR
    CHOICE" prompt
170 A$ = INKEY$ IF A$ = "" THEN GOTO 170 read
    keyboard
180 CN = INSTR (1 CN$ A$) convert to number
190 IF CN = 0 THEN GOTO 170 key OK? if not
    repeat
200 IF CN = 4 THEN CLS PRINT "END OF PROG
    RAM" END terminate if required
210 CLS clear screen again
220 PRINT "ENTER ITEM TO SEARCH FOR"
    prompt
230 INPUT TA$ get target string
240 GOSUB 1000 do the searches
250 GOTO 100 repeat the main menu
```

This section of code displays the menu and gets the value of the variable *Cn* as the number of the field or column to search This is achieved by testing the key pressed by the user. If it is one of the letters "N", "A", "P", or "E", then its position in *Cn$* ("Nape") is given by *Instr* (line 180) This is a much simpler and more elegant method than such lines as

```
170 IF A$ = "N" THEN CN = 1
171 IF A$ = "A" THEN CN = 2
172 IF A$ = "P" THEN CN = 3
173 IF A$ = "E" THEN CN = 4
```

or the hideous and unnecessarily complex formula beloved of some programmers

```
170 CN = ABS( (A$ = "N") + 2*(A$ = "A") + 3*(A$
    = "P") + 4*(A$ = "E"))
```

Instr returns the value 0 if the *Target$* is not in the *Source$*, otherwise it returns the starting position of the *Target$* in the *Source$* The general form of *Instr* is *P* = *Instr* (starting point in *Source$* *Source$* *Target$*)

We now have the variable *Cn* as the column number to search We now need to design code to step through all the rows checking this column for the target string For this we could use a *For* (all rows) *Next* loop as in the previous examples Within this loop we will be testing all *Ar$(R Cn)* cells for the presence of *Ta$* — the target string If it is found we want to display all the information in the row To do this we can call a subroutine which does just this — assuming the display subroutine to be at line 1100 the core statement in the search routine becomes

```
1020 IF INSTR(1,AR$(R CN) TA$) > 0 THEN
     GOSUB 1100
```

We use this in preference to

```
1020 IF TA$ = AR$(R CN) THEN GOSUB 1100
```

because the former will find substrings that is, it will pick out a word like "boat" from strings like "power-boats", "boat-buildings" "boating", "boater" and so on It increases the scope of the search and allows the user to be a bit imprecise to get more information out of the system Of course we could design a system which would allow the user to decide whether direct matching was required or not

It might prove useful to a user to know how many finds there were so we will have to keep track using a variable such as *Tf* – *Total Finds* (do make your variables easy to remember by giving them meaningful letters) This means an addition to line 1020

```
1020 IF INSTR(1 AR$(R CN) TA$) > 0 THEN TF =
     TF + 1 GOSUB 1100
```

We don't want to increase *Tf* in the display routine because we may want to call this routine from other areas of the program without affecting *Tf*

Finally we will want a subroutine which suspends the program at various points to allow the user to assimilate information on the screen A pause routine would do but better by far is a routine which prompts the user to press a key in order to proceed This is necessary in order to prevent too much information scrolling up the screen too fast to be any use to the user This will take the form

```
1200 PRINT
1210 PRINT "PRESS THE SPACE BAR TO CON
     TINUE
1220 A$ = INKEY$
1230 IF A$ <> CHR$(32) THEN GOTO 1230
1240 RETURN
```

Ideally the prompt would appear at the foot of the screen and be erased just before the *Return* is executed

The coding for the search routine is thus

```
1000 TF = 0
1010 FOR R = 1 TO NR
1020 IF INSTR(1 AR$(R,CN) TA$) > 0 THEN TF
     TF + 1 GOSUB 1100
1030 NEXT
1040 PRINT
1050 PRINT "NUMBER OF FINDS = " TF
1060 GOSUB 1200
1070 RETURN

1100 FOR C = 1 TO NC
1110 PRINT AR$(R C)
1120 NEXT
1130 GOSUB 1200
1140 RETURN

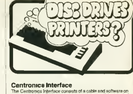
1200 PRINT
1210 PRINT "PRESS THE SPACE BAR TO CON
     TINUE
1220 A$ = INKEY$
1230 IF A$ <> CHR$(32) THEN GOTO 1220
1240 RETURN
```

Notice that "UPDATE ROW" in Fig 2 is automatically taken care of by the *Next* in line 1030, being part of the loop which deals with each row in turn

You should be able to modify this program to improve its appearance on screen allow the user to enter the data to begin with and if you can store string arrays to tape you have the heart of a personal database!

To sum up the most important points here are

a) The use of string arrays to hold related information
b) The building of routines around "core" statements
c) Constructing a program from "blocks" of algorithms
d) Designing part of a program according to the user's point of view ■



This program was written for the Dragon 32 but it is designed to be easy to convert for all micros

```
1Ø REM DATABASE+SEARCH ROUTINE
2Ø REM SET UP ARRAY
3Ø CN$="NAPE"
4Ø NR=5
5Ø NC = 3
6Ø DIM AR$(NR,NE)
7Ø FOR R = 1 TO NR
8Ø FOR C = 1 TO NC
9Ø READ AR$(R,C)
1ØØ NEXT C
11Ø NEXT R
12Ø REM ARRAY SET UP
13Ø REM SEARCH ROUTINE MENU
14Ø CLS
15Ø PRINT "N...NAME"
16Ø PRINT "A...ADDRESS"
17Ø PRINT "P...PHONE"
18Ø PRINT "E...END"
19Ø PRINT
2ØØ PRINT "PRESS THE LETTER OF YOUR CHOICE"
21Ø A$ = INKEY$:IF A$ = "" THEN 21Ø
22Ø CN = INSTR(1,CN$,A$)
23Ø IF CN = Ø THEN GOTO 21Ø
24Ø IF CN = 4 THEN CLS:PRINT "END OF PROGRAM":END
25Ø CLS
26Ø PRINT "ENTER ITEM TO SEARCH FOR"
27Ø INPUT TA$
28Ø GOSUB 31Ø
29Ø GOTO 14Ø
3ØØ REM SEARCH ROUTINE
31Ø TF = Ø
32Ø FOR R = 1 TO NR
33Ø IF INSTR(1,AR$(R,CN),TA$) > Ø THEN TF = TF+1:GOSUB 4ØØ
34Ø NEXT
35Ø PRINT
36Ø PRINT "NUMBER OF FINDS=";TF
37Ø GOSUB 47Ø
38Ø RETURN
39Ø REM SUBROUTINE TO DISPLAY ALL CELLS IN A ROW "R"
4ØØ FOR C = 1 TO NC
41Ø PRINT AR$(R,C)
42Ø NEXT
43Ø GOSUB 47Ø
44Ø RETURN
45Ø REM END OF DISPLAY ROUTINE
46Ø REM SPACE TO CONTINUE SUB ROUTINE
47Ø PRINT
48Ø PRINT "PRESS THE SPACE BAR TO CONTINUE"
49Ø A$ = INKEY$
5ØØ IF A$ <> CHR$(32) THEN GOTO 49Ø
51Ø RETURN
52Ø REM END OF ROUTINE
53Ø REM DATA STATEMENTS
54Ø DATA PETER JONES,13 HIGH STREET NEWTOWN,Ø213-415
55Ø DATA MARY PHILLIPS,26 BROADWAY OLDTOWN,Ø98-5647
56Ø DATA FRANK PAULSON,5 FARM COTTAGES NRAXALL WILTS,7654-5643
57Ø DATA FRED BLOGGS, 34 NORTH STREET HORNCHURCH ESSEX,453-7865
58Ø DATA MARIA TEMME,198 SOUTH STREET DEVONPORT LINCS,Ø956-3462
```

Play it again . . . and again

***Gordon McQueen** explains how to record and replay sound on your micro*

This program will enable your Dragon or color computer to repeat any sound you input to it.

To input sound to the computer the cassette is used in either of two ways. The first method is the easiest: all you do is record the speech or noise on a tape and then play that tape into the computer.

The second method will only work with some cassette recorders. Remove all the jack plugs from the tape deck except for the ear jack. Then look inside the cassette compartment for a little lever which is located opposite the record head.

If you have difficulty locating this lever then look at a cassette tape and find the tabs that you break if you want to protect the tape from accidental recording. Now if you look into the cassette compartment where this tab would be positioned you will see the lever.

Once the lever has been located simply press it in and press record and play on your recorder. When you speak into the microphone on your tape deck the signal will be sent into the computer and stored.

The machine code routines used to record and playback the sound begin at memory locations *7D00* hex and end at *7D5A* hex. The recorded sound is stored between locations *1E00* hex and *7CFF* hex, hence 32K of memory is required. It would be possible to change these memory locations but the amount of storage would be greatly reduced.

The record program reads the cassette input which is bit 0 of location *FF20* hex and this value is added with 1 to produce a 1 or a zero. Since the required information is only one bit long then one byte can hold eight bits of information.

The byte being used is shifted to the left and if the cassette input is a one then the contents of the byte are incremented, which raises bit zero. If the procedure has been performed eight times, then checks are made to see if the end of the data has been reached. If not another byte of information is input.

The replay routine enables the sound output by oring the contents of *FF23* hex with eight. Each byte of data is then taken in turn and has its bits tested using the *Bit* instruction which performs an *and* operation and sets the condition code register accordingly but does not affect the register. If the operation was carried out on *It* after the *Bit* operation the result is zero then the sound output addresses *FF28* hex is cleared otherwise it has *Fd* hex stored in it. If *FF* hex was stored in this location and Tandy's *Edleasm+* cartridge was being used then the cartridge would be reset. This process is repeated until the end of the data has been reached.

As well as the assembler listing I have included a Basic program which loads the machine code from data statements. Instead of using the *Defusrn* statement I have used the *Exec* statement as I have found that the Dragon can only access *Usro* whereas the Tandy color computer can access all 10 of the *Usr* routines. Perhaps there is a bug in the Rom. ■

```
7D00                00100            ORG 32000
          FF20      00110 IN         EQU 65312
          FF28      00120 OUT        EQU 65320
7D00 8E   1E00      00180 START      LDX #7680
7D03 6F   84        00190 GETBIT     CLR ,X
7D05 5F             00200            CLRB
7D06 68   84        00210 CHECK      ASL ,X
7D09 B6   FF20      00220            LDA IN
7D0B 84   01        00230            ANDA #1
7D0D 27   02        00240            BEQ ZERO
7D0F 6C   84        00250            INC ,X
7D11 5C             00260 ZERO       INCB
7D12 C1   08        00270            CMPB #8
7D14 26   F0        00280            BNE CHECK
7D16 30   01        00290 NEXT       LEAX 1,X
7D18 8C   7D00      00300            CMPX #$7D00
7D1B 25   E6        00310            BLO GETBIT
7D1D 39             00320 AAA        RTS
7D1E B6   FF23      00390 GO         LDA >$FF23
7D21 8A   08        00400            ORA #8
7D23 B7   FF23      00410            STA >$FF23
7D26 86   FF        00420            LDA #$FF
7D28 B7   FF28      00430            STA OUT
7D2B 8E   1E00      00440            LDX #7680
7D2E 108E 7D52      00450            LDY #DATA
7D32 A6   80        00460 SND        LDA ,X+
7D34 A5   A0        00470 SNDOUT     BITA ,Y+
7D36 27   07        00480            BEQ CLEAR
7D38 C6   FD        00490            LDB #$FD
7D3A F7   FF28      00500            STB OUT
7D3D 20   03        00510            BRA FIN
7D3F 7F   FF20      00520 CLEAR      CLR OUT
7D42 108C 7D5A      00530 FIN        CMPY #WELLY
7D46 26   EC        00540            BNE SNDOUT
7D48 108E 7D52      00550            LDY #DATA
7D4C 8C   7D00      00560            CMPX #$7D00
7D4F 26   E1        00570            BNE SND
7D51 39             00580 DONE       RTS
7D52      8040      00590 DATA       FDB $8040
7D54      2010      00600            FDB $2010
7D56      0804      00610            FDB $0804
7D58      0201      00620            FDB $0201
7D5A 12             00630 WELLY      NOP
          0000      00640            END
00000 TOTAL ERRORS
```

Continued on page 23



Allows you to use any Atari/Commodore type Joystick with the Spectrum. Simply plugs into the Spectrum. Complete with 12 months' guarantee

JOYSTICK COMPATIBLE SOFTWARE FROM

KEMPSOFT

FOR THE SPECTRUM

ORDER NOW!

☐	Astro Blaster	16K Quicksilva	£4.95
☐	Blind Alley	16K Sunshine	£4.95
☐	Cosmic Guerilla	16K Crystal	£5.95
☐	Cosmos	16K Abbex	£5.95
☐	Cyber Rats	16K Silversoft	£5.95
☐	ETX	16K Abbex	£5.95
☐	Frenzy	16K Quicksilva	£4.95
☐	Frogger	16K DJL	£5.95
☐	Galaxians	16K Artic	£4.95
☐	Gulpman	16K Campbell Sys.	£4.95
☐	Jet Pac	16K Ultimate	£5.95
☐	Joust	16K Softek	£5.95
☐	Knot in 3D	48K New Gen	£5.95
☐	Mazeman	16K Abersoft	£5.95
☐	Meteoroids	16K Softek	£4.95
☐	Night Flite	16K Hewson Cons	£5.95
☐	PSSST	16K Ultimate	£5.95
☐	3D Tunnel	16/48K New Gen	£5.95
☐	Time Gate	48K Quicksilva	£6.95
☐	Slippery Sid	16K Silversoft	£5.95
☐	Spookyman	16K Abbex	£4.95
☐	Conversion Tape I	Kempsoft	£4.95
☐	Conversion Tape II	Kempsoft	£4.95
☐	Spectrum joystick interface only £15.00		

Please tick appropriate boxes.
Prices include P&P and VAT. Overseas prices add £4.00 P&P Total £

Cheques/Postal Orders should be made payable to Kempston (Micro) Electronics Ltd.

Name ________ Signature ________

Address ________

Please debit my Access/Visa Account No

* Delete as applicable

Kempston (Micro) Electronics Ltd Dept PCW6
180a Bedford Road Kempston Bedford MK42 8BL

IT'S ANOTHER CLEVER IDEA FROM STACK

AND SO ECONOMICAL! ......

THE EXTRA CARTRIDGE SOCKET AND ROM SOCKET MAKE IT VERY VERSATILE!!!

IT'S GREAT! I CAN ADD EXTRA MEMORY USING MY POCKET MONEY

Have YOU got your STACK STOREBOARD yet?

Expand your VIC-20 memory from a youthful 5k to a mature 32k. Supplied with 8k fitted the STOREBOARD allows you to build up the size of your VIC-20's memory whenever you NEED more memory or whenever you can AFFORD it! This means you get a FLEXIBLE system that SAVES YOU MONEY!!!

Compare these prices* ..

Stack 8k Storeboard	48.00	Commodore 16k Cartridge	80.17
1st 8k Ram Pack	31.00	8k Cartridge	39.95
2nd 8k Ram Pack	31.00	3k Cartridge	29.39
3k Ram Pack	11.00	4 slot Motherboard	29.38
27k Expansion	100.00	27k Expansion	108.50
TOTAL SAVING	37.50		

STACK
Computer Services Limited

290/298 Derby Road
Bootle Merseyside L20 8LN
Tel Sales 051-933 5511
Service 051-933 3355
Telex 627026 (Stack-G)

GREAT VALUE FOR MONEY WITH OUR

SPECTRUM

SOFTWARE
GAMES FOR THE 16K or 48K SPECTRUM

MONGOOSE (m/c) and BEAR ISLAND £4.95
Fast and furious arcade action with these colourful high speed games

REVERSI (m/c) and POKER DICE £4.95
Classic strategy and addictive gambling games

TIME LINE (m/c) and TASKS £4.95
A superb 16K text adventure and a collection of mind stimulating puzzles

MAGIC CASTLE (m/c 48K only) £4.95
A gripping adventure. Rescue the princess but beware of booby traps and vampires

3D MAZE OF GOLD (m/c) £5.95
Amazing full colour high resolution views as you walk around a large labyrinth

EXTEND SPECTRUM BASIC (16K or 48K) WITH WHITE NOISE AND GRAPHICS (m/c) £5.95
Adds many useful commands to BASIC including a window system and true explosion type sound effects. Extensive manual supplied

EDUCATIONAL PROGRAMS

CESIL £5.95
A widely used O-level teaching language available for 16K or 48K **Spectrum Dragon 32** and **16K ZX81**. Supplied with a comprehensive manual

HAL £5.95
Another popular O-level teaching language for the 16K or 48K **Spectrum**

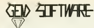
VISUAL PROCESSOR £5.95
Provides an on screen display of a simple Micro-processor illustrating its internal operation as it runs your programs. With comprehensive manual. For the 16K or 48K Spectrum

Our Software is now available from many computer shops nationwide, or direct from us by post or phone. SAE for details. Dealer enquiries welcome

GILSOFT
30 Hawthorn Road, Barry
South Glam CF6 8LE
Tel (0446) 736369

TELEPHONE YOUR ORDER WITH

Access



```
0 'REPEAT POR THE DRAGON 32
1 'OR THE 32K TANDY COLOUR
2 'COMPUTER
3 'BY
4 'GORDON MCQUEEN
10 PCLEAR1
20 DATA  142, 30, 0, 111, 132, 95,
   104, 132, 102
30 DATA  255, 32, 132, 1, 39, 2,
   108, 132, 92, 193
40 DATA  8, 38, 240, 48, 1, 140,
   125, 0, 37, 230
50 DATA  57, 182, 255, 35, 138, 8,
   183, 255, 35, 134
60 DATA  255, 183, 255, 40, 142,
   30, 0, 16, 142, 125
70 DATA  82, 166, 128, 165, 160,
   39, 7, 198, 253, 247
80 DATA  255, 40, 32, 3, 127, 255,
   40, 16, 140, 125
90 DATA  90, 38, 236, 16, 142, 125,
   82, 140, 125, 0
100 DATA  38, 225, 57, 128, 64, 32,
   16, 8, 4, 2
110 DATA  1, 18
120 FOR I=&H7D00 TO &H7D5A
130 READ P
140 POKEI,P
150 NEXT I
160 CLS
170 PRINT"PLAY OR RECORD (P/R)?"
180 IN$=INKEY$
190 IF IN$<>"P" AND IN$<>"R" THEN
    180
200 IF IN$="R" THEN 240
210 CLS
220 EXEC &H7D1E
230 GOTO 160
240 CLS
250 PRINT"RECORDING"
260 SCREEN0,1
270 EXEC&H7D00
280 GOTO 160
```

AAA	7D1D	IN	FF20
CHECK	7D06	NEXT	7D16
CLEAR	7D3F	OUT	FF20
DATA	7D52	SND	7D32
DONE	7D51	SNDOUT	7D34
FIN	7D42	START	7D00
GETBIT	7D03	WELLY	7D5A
GO	7D1E	ZERO	7D11

Memories are made of this

***Ian Logan** looks at the Spectrum memory map in the first of a five-part series*

In all microcomputers, it is necessary to allocate different parts of the memory map to different tasks. The user is not usually aware of this but it does affect the 'appearance' of the machine considerably.

In the Spectrum's memory map the first area from address 0 — address 16383 (0000h-03FFh) is given over to the Rom (Read Only Memory). This single chip contains a complex machine code program that forms the operating system and the Basic interpreter of the Spectrum. It is not possible to move the Rom program to any other part of the memory map as it contains many absolute addresses and Z80 *Rst* instructions that are dependent on the program being at address 0 onwards. It is however possible to page-out the Rom completely which happens whenever the 'shadow' Rom of the microdrive interface unit is used.

There are many subroutines in the Rom that can be used via the Basic *USR* command and some of them will be detailed in this article.

There are four fixed-length areas above the Rom. The first one is the display file (6K) that holds the bit by bit representation of the screen display. The second area is the attribute space (3/4K) that holds the colour details for the character areas of the screen display. It is clearly a limitation of the Spectrum that only two colours can be held for a whole character area at any time. The provision of more memory to this purpose would have made the Spectrum much more expensive.

The third area is the printer buffer (1/4K). This buffer allows for the storage of 32 characters and thereby applies some limitation when lines of a longer length are to be printed. If the printer buffer were longer, say 80 characters, then printing would be easier but extra locations would have to be dedicated to this purpose.

The fourth fixed-length area is the system variables space. This is a most important part of the Ram and forms a storage area for the many temporary values that have to be held when the Spectrum is being used. The most important system variables are the set of pointers that show where the 'dynamic areas' are to be found.

Within the system variables area there are two special sub-areas. The first of these is the streams area that holds offset values for each of the 19 streams that can be used in the Spectrum system. The second is the calculator's memory area. This forms a temporary store for six 5-byte floating-point numbers and is used as an ordered scratch pad when performing calculations of many kinds. Overall 182 locations (or 239 locations when the 'shadow' Rom is called) are used to hold the system variables of the Spectrum.

Above the fixed-length areas, starting at 23734 (5CB6h) — or 23792 (5CF0h) — are the dynamic areas of the Spectrum. These areas are of varying length and position. The length allocated to a particular area at a given moment depends on how much is to be held in that area at that moment — and the position depends on the size of the areas beneath it. In the Spectrum, locations are allocated to the dynamic areas for a variety of purposes but once the locations are no longer required then they are reclaimed. The locations that are free constitute the 'spare' area above the dynamic areas and below the machine stack.

The first of the dynamic areas is the microdrive map. This area will have 0, 32, 64, 256 locations depending on how many microdrives are *Open* for use. As it is possible to hold 256 bits in each block of 32 bytes, a microdrive can have up to 256 sectors with each sector having a flag that shows whether it is 'free' or 'busy'.

The second dynamic area is the channel information space. This area is addressed by the pointer *Chans*. In this area is held the data referring to the input and output devices currently available to the Spectrum. In the basic Spectrum there are four devices detailed in this area: the keyboard, the screen, the work space and the printer.

For each device, the data consists of an 'output address', an input address and an 'identifying letter'. However when the microdrive network RS232 interface unit is fitted, it is possible for the 'shadow' Rom to create channel information for these devices. In the cases of microdrive and network channels it is necessary to set up input and output buffers which are also put in the channel information area.

One of the features of the Spectrum system is the way in which the various

The Spectrum's Memory Map (lower part only and not to scale)

SPARE
<- STKEND
CALCULATOR STACK
<- STKBOT
WORK SPACE
<- WORKSP
EDIT LINE BUFFER
<- E LINE
VARIABLES AREA
<- VARS
PROGRAM AREA
<- PROG
CHANNEL INFORMATION
<- CHANS
MICRODRIVE MAPS
(called DRIVES)
23734 -> (or 23792)
SYSTEM VARIABLES
23552 -> <- 5C00h
PRINTER BUFFER
23296 -> <- 5B00h
ATTRIBUTE AREA
22528 -> <- 5800h
DISPLAY FILE
16384 -> <- 4000h
ROM
0 -> <- 0000h
decimal
hexadecimal
Dynamic areas with their system variable pointers
Fixed length areas

available channels can be linked to the Basic streams Once linked the stream-bytes (held in the streams area) hold the offset between the starting location of the required channel information and the address held in *Chans* Note that several streams may be linked to a single channel at the same time but that it is impossible and illogical to attempt to link one stream to more than one channel

The third dynamic area is the Basic program area. To the user it appears that this area is in the television when a listing is being shown but in reality any lines that have been entered by the user into the Spectrum are stored in the program area A Basic line in this area is stored in the following format

the line number the remaining length the line itself and finally a carriage return character

The lines are all stored in ascending order and contain Ascii characters tokens control characters and the special floating-point forms The latter are inserted in syntax time and lead to a faster run time All decimal numbers are followed by these floating point forms although to the user they are normally invisible

When a listing is produced the Basic lines are considered in turn The line numbers are displayed as integers the tokens are expanded to give the appropriate characters ordinary Ascii characters are printed and control characters dealt with The floating-point forms are simply ignored

Above the program area comes the variables area This area is only used to hold the current values for Basic variables All numbers are held in five bytes — either in true floating-point form or in the short integer forms — all strings are held as 'strings of characters

There are two points of special note concerning the variables area 1) 'Garbage collection is fully integrated with string variable creation and there are never any 'unattached strings to be collected

2) The elements of a *For-Next* variable are manipulated by addressing such a variable temporarily as the calculator s memory area By so doing the subroutines for handling the memory area can be used for a second purpose thereby saving room in the Rom program

The next area is the edit-line buffer which holds the characters entered by the user during 'editing These entries can form a Basic line, with a line number that subsequently will be added to the program area, or a 'direct Basic command that will be executed immediately Interestingly, the 'edit-line has the line number '—2 but this is only given during run-time (owners of ZX80s might recognise this '—2)

Above the edit line comes the work space This is a most interesting area as it can be filled from either end as necessary but only cleared in toto The lower part of the work space is used for replies to the Basic command *Input* In such cases the work space is used instead of the edit-line buffer allowing subroutines within the Rom to be used again for two purposes The upper part of the work space is a true scratch-pad area and is used for a variety of purposes — such as the evaluation of *Val* expressions the holding of tape headers etc

The last of the dynamic areas is the calculator stack Once again, this acts as scratch pad for floating point numbers (and string descriptors) Indeed there is an internal stack language within the Spectrum for manipulating the items of this stack

Above the calculator stack comes the 'spare area that extends as far as the machine stack In a Spectrum an estimate of the size of this area is given by the line

```
PRINT 65536-USR 7962   bytes are free
```

As explained earlier locations are 'allocated to the various dynamic areas as required by current needs — these locations are then reclaimed when no longer needed Indeed as locations are allocated or 'reclaimed all the bytes above the 'position of change have to be moved up/down as needed Also the pointers held in the system variables area that point past the position of change have to be increased/decreased as required

The subroutine for moving the dynamic areas 'up is to be found at address 1655h and is named, by myself, *Make-room* and by Sinclair *Insert* In order to call this routine the *BC* register pair has to hold the number of bytes to be added and the *HL* register pair the 'position of change The actual lines of the subroutine are

```
MAKE ROOM (INSERT) EQU 1655h
    PUSH HL
    CALL 1F05h TEST-ROOM (CHK.SZ)
    POP HL
    CALL 1664h POINTERS (REMGSZ)
    LD HL, (STKEND)
    EX DE HL
    LDDR
    RET
```

Notes

The *Test room* subroutine will give error 4 — Out of memory if there are insufficient 'spare locations The *Pointers* subroutine increases all the necessary pointers by '*BC*' The *LDDR* instruction does a block moving operation to copy up all the bytes required

The 'reclaiming of bytes is performed most easily by using the *Reclaim–2* (*De-trec*) subroutine Once again the *BC* register pair holds the length of the area and the *HL* register pair the address of the 'position of change The *Reclaim–2* subroutine is at 19E8h

It may interest readers to know that there is a definite 'bug in the 'reclaiming code in that the block of memory that is moved is too large Fortunately no harm is done

The next article in this series will discuss *Syntax Checking* ■

Table 1

CLASS-00	–	No further operands.
CLASS-01	–	Used in LET. A variable is required.
CLASS-02	–	Used in LET. An expression, numeric or string, must follow.
CLASS-03	–	A numeric expression must follow. Zero to be used in case of default.
CLASS-04	–	A single character variable must follow.
CLASS-05	–	A set of items may be given.
CLASS-06	–	A numeric expression must follow.
CLASS-07	–	Handles colour items.
CLASS-08	–	Two numeric expressions, separated by a comma, must follow.
CLASS-09	–	As for CLASS-08 but colour items may precede the expressions.
CLASS-0A	–	A string expression must follow.
CLASS-0B	–	Handles cassette routines.

Long division . . .

Jeremy Ruston explains how to translate simple arithmetical operations into assembly language routines

One stumbling block when you are learning assembly language is the total absence of some of the features that are taken for granted in Basic. These include instructions for such simple operations as multiplication and division, program control statements such as *For — Next* and *Repeat — Until* loops. This article is designed to show you how easy it is to translate your knowledge of arithmetic into assembly language routines and so to develop routines for addition, multiplication, subtraction and division in assembly language with the minimum of effort on your part.

This article is aimed at users of the 6502 micro-processor inside the BBC Micro. The techniques can easily be applied to other processors such as the 6809 and the Z80 (in the case of the Z80 you will have to adopt slightly different programming methods. This is because the register orientated architecture of the Z80 is rather different from that of the 6502, where virtually all instructions reference external memory.)

If you have studied the 6502 instruction set you will have discovered the instructions used for shifting the bits in a byte left or right. These instructions come in four forms.

Asl — shifts the contents of a memory location or the accumulator, one bit to the left. The least significant bit assumes a value of zero. For example, the binary number 01101011 (6B hex, 107 decimal) would turn into 11010110 (D6 hex, 214 decimal) after an *Asl* instruction. The most significant bit of the original number is always copied into the carry flag. The good thing about the *Asl* instruction is that it multiplies by two each time a shift is carried out.

Lsr is the opposite of *Asl* in that it shifts a byte one position to the right. The most significant bit becomes zero and the least significant bit is copied into the carry flag. Consequently, it divides a memory byte by two.

Rol is identical to *Asl* except that the least significant bit is not automatically set to zero, instead the current status of the carry flag is used.

Ror is identical to *Lsr* except that, like *Rol*, the most significant bit is set to the carry flag.

These last two instructions allow you to shift numbers which are larger than a single byte wide. For example, to shift the four bytes starting at address &80 you could use:

Asl &80
Rol &81
Rol &82
Rol &83

The *Asl* instruction as it stands can be used to multiply by 2, 4, 8, 16 and so on. This can be done because if you follow one *Asl* instruction by another the effect of each is compounded. For example, three *Asls* will multiply by 2 three times, giving 2*2*2. This is a total multiplication factor of eight. If you continued along these lines you would get factors of 16 and 32, etc.

But you may wish to multiply by a number other than 2, 4, 8, 16, 32, etc. This is relatively easy to do. Given a multiplication factor, say five, we can see that multiplying X by 5 can be represented as 4*X + X. Therefore, to multiply a number by 5, one need only multiply by 4, using the arithmetic shift left instruction, and then add on the original number.

This technique can be extended to apply to other multiplication factors. For example, we can represent a multiplication by 7 as 4*X + 2*X + X. This may not appear to bring us any closer to a fully general multiplication routine which will multiply any two numbers together, but it does come nearer that point.

Part of the solution is to examine our original theory of multiplying by low numbers. We started off with 5*X. Five in binary is 0101. The weightings assigned to each binary digit start at 1 and ascend through 2, 4, 8, etc, multiplying by two each time. The interesting thing to note is that when we were doing multiplication in terms of arithmetic shifts and additions, we multiplied by 4 and then 1 for a multiplication of five. Obviously there is a connection between what you must multiply X by and the binary representation of the number that is being multiplied.

We can now say that to multiply any two arbitrarily long binary numbers we must scan one of the numbers and for every position in which there is a 1 in the number (a bit is set), we must multiply the other number in the calculation by the weighting assigned to the original bit position. We must then add together the results of these calculations.

In other words, if the detected bit has a value of 16, we must multiply the other number by 16 and add this result to the grand total. A perfectly reasonable multiplication routine can be built using this technique. However, it is easier in most circumstances to use the fact that a given multiplication will also do an arithmetic shift left in the process of doing multiplication. This is a complicated way of explaining that if you have two eight bit numbers X and Y, the multiplication process should go something like this:

(1) The result will be stored in location Z.
(2) Do an arithmetic shift left (*Asl* instruction) of the X byte. If the bit that falls off the end of X, ie, the bit that ends up in the carry is set then set Z to Z + Y.
(3) Shift left Z and X.
(4) Repeat the process as many times as there are bits in the two original numbers.

The following program, written in BBC Basic, shows an assembly language program to multiply two eight bit numbers together (unsigned arithmetic is used, but that's another story).

The program as presented here will not detect overflow (as in 200*200), but this is relatively easy to add. It is interesting to note that if you do decide to detect overflow you can assume that one of the two numbers will be less than 16, since if they were both 16 or greater, overflow would be bound to result.

Thus, it would be possible to alter the range of the loop in the program to 4, but you would have to swap around the numbers N1 and N2, according to which had the top four bits set to zero, and take appropriate action if neither did.

The brackets in line 180 are necessary to prevent an obscure bug/feature in BBC Basic where if you carry out *Asl* (or *Rol*, *Ror* etc) on a label starting with "A", the system interprets you to be using accumulator addressing. This means that *Asl Ans* would be treated as *Asl A NS*! ■

This is an extract from *The BBC Micro Compendium*, available from 1 August from Interface Publications, 44 Earl's Court Road, London W8 6EJ.

```
>LIST
   10 REM 8 bit binary multiplication
   20
   30 REM (c) 1983 Jeremy Ruston
   40
   50 DIM SPACE 100
   60 N1=&80:REM storage for first number
   70 N2=&81:REM storage for second number
   80 ANS=&82:REM storage for answer
   90 FOR LOOP=0 TO 2 STEP 2
  100 P%=SPACE
  110[OPT LOOP
  120
  130 .MULTIPLY
  140 LDA #0        \Zero answer
  150 STA ANS
  160 LDX #8        \Set up loop
  170.START
  180 ASL (ANS)     \Multiply answer
  190 ASL N1        \Copy bit 7 to carry
  200 BCC NO_ADD    \If the bit was zero, skip
      addition
  210 LDA N2        \Get addition factor
  220 CLC           \Clear carry for addition
  230 ADC ANS       \Add into answer
  240 STA ANS       \Store back to answer
  250 .NO_ADD
  260 DEX           \Check for end of loop
  270 BNE START
  280 RTS
  290]NEXT LOOP
  300
  310 REPEAT
  320 INPUT "Enter two numbers:"?N1,?N2
  330 CALL MULTIPLY
  340 PRINT "Answer is ";?ANS
  350 UNTIL FALSE
>
```

OPEN FORUM

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the *Program of the Week* double our new fee of £6 for each program published.

Defender

on Vic20

In this game the object is to score as many points as possible and to travel as far as you can along the enemy mountains, before you lose all your ships.

You start off with three ships. You lose a ship for crashing into the ground or into an enemy base, you can also lose a ship for running out of fuel! Your fuel supply is displayed at the bottom of the screen, when you are nearly empty there will be a warning signal and then the last unit of fuel will flash.

You score ten points for each enemy base hit and you gain fuel.

The controls are

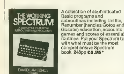
1—Up
Z—Down
Cursor right—Fire
Cursor down—Bomb

The program uses high resolution graphics and is for the unexpanded Vic20. In the program there is a short machine code routine to scroll the screen from right to left.

```
8 POKE52,29:POKE56,28
12 FORH=829TO874:READB:POKEH,B:NEXTA:
   GOSUB1000
20 DATA169,19,32,210,255,169,29,32,210,255,
   169,13,32,210,255,169,0,141,60,3
30 DATA169,29,32,210,255,169,24,32,210,255,
   169,13,32,210,255,238,60,3,173,60,3
40 DATA201,21,208,231,96
41 POKE36879,8:PRINT"":POKE36878,15:CR=64
   +128:V=30720:H=A:POKE650,128:P=36877:
   S=0:F=
42 LIVES=2:PA=10:U=0
50 POKE7879+D,0:PRINT"
51 IFPA=INT(PA)THENPRINT"                 V
   "F$:
52 IFPA<>INT(PA)THENPRINT"
   H1-"HI
53 C=RND(1):ZY=RND(1):PRINT"  CORE"S
54 POKE8164,128+6:POKE8164+1,21+128:POKE
   8164+2,5+129:POKE8164+3,12+128
55 FORSXC=1TOF:POKE8164+5+SXC,128+64:NEXT
56 POKE36877,0
60 IFC>.5ANDX=1THENH=H+1:CHR=78:GOTO200
70 IFC>.5ANDX=0THENX=1:Z=0:CHR=79:GOTO200
80 IFC<.5ANDZ=1THENH=H-1:CHR=77:GOTO200
90 IFC<.5ANDZ=0THENZ=1:CHR=77:X=0:GOTO200
95 IFF<5THENPOKE36876,0
100 IFC<.5ANDX=1THENX=0:H=H-1:GOTO200
110 IFC>.5ANDZ=1:Z=0:H=H-1:GOTO200
200 POKE8163-22*H,CHR+128:POKE30720+8163
    -22*H,1:IFZX>.0THENPOKE8163-22*H-22,1
201 IFU=1600THENPOKE36877,240
202 IFU=1600THENPRINT"      YOU MADE IT!"
    :PRINT"  BACK TO BASE":PRINT WITH "S"
    POINTS"
203 IFU=1600THENGOTO3020
207 IFU>=1500THENPOKE36879,9
208 U=U+1:SYS(829):IFH<2THENC=.6:GOTO60
215 IFH>18THENC=.4:GOTO60
220 GETA$:IFA$="1"THEND=D-22
230 IFA$="Z"THEND=D+22
231 IFA$=" "THEN2000
232 IFA$=" "THEN3100
234 IFPEEK(7878+1+D)=205ORPEEK(7878+1+D)=
    206ORPEEK(7878+1+D)=1THEN1100
240 POKE8164+F+6,32:F=F-.1:IFF<5THENPOKE
    36876,255:POKE36875,128
245 IFF=<0THENGOTO1100
250 IFX>1THENX=X-1:GOTO200
251 PA=PA+.5:GOTO50
1000 FORI=7168TO7679:POKEI,PEEK(I+25600)
     :NEXT
1010 FORC=7168TO7222:READA:POKEC,A:NEXT
1020 DATA0,128,192,224,254,255,255,0,60,60,
     126,126,255,60,66,129,0,20,8,8,8,20,8,8
1081 DATA1,40,52,67,68,72,138,138,240,12,4,
     228,18,146,82,82,178,82,89,72,71,52,
     62,1
1082 DATA81,82,146,36,196,12,48,192
1085 POKE36869,255:RETURN
1100 POKE7878+D-22,5:POKE7878-21+D,4:
     POKE7878+D,5:POKE7878+D+1,6
1101 POKE7878+30720-22+D,1:POKE7878+D+30720
     -21,1
1102 POKE7878+D+30720,1:POKE7878+D+1+
     30720,1
1105 FORA=15TO0STEP-.2:POKE36878,A:POKE
     36877,200:F=15
1161 IFA<13THENPOKE7878+D-22,32:POKE7878-
     21+D,32:POKE7878+D,32:POKE7878+D+1,32
1162 NEXTA:POKE36879,0
1500 LIVES=LIVES-1:POKE36878,15:PRINT""
1525 IFLIVES<=0THENGOTO3000
1530 POKE36876,0:POKE36875,0:POKE36877,
     0:GOTO50
2000 F=F-.5:FORAB=2TO15
2001 IFPEEK(7878+D+AB)<>32THENGOTO2040
2005 POKE7878+D+AB,74+128:POKE7878+D+AB-1,
     32:POKE7878+D,0:NEXTAB
2012 POKE7878+D+15,32:GOTO50
2040 IFPEEK(7878+D+AB)=77+128ORPEEK(7878+D
     +AB)=78+128THENPOKE7878+D+AB-1,32:
     GOTO50
2045 IFPEEK(7878+D+AB)=1THENPOKE7878+D+AB
     -1,32:GOTO2500
2050 GOTO2005
2500 IFPEEK(7878+AB+D+1)=1THENF=F+1:S=S+10
2501 IFPEEK(7878+AB+D+23)=1THENF=F+1:S=S+10
2502 POKEP,128:POKE7878-22+AB+D,5:POKE7878
     +AB-22+D+1,4:POKE7878+AB+D,5:POKE7878
     +AB+D+1,6
2510 POKE7878+AB+D-22,32:POKE7878+AB+D-22+1
     ,32:POKE7878+AB+D,32:POKE7878+AB+D+1,32
2515 IFI=5THENPOKE7878+D+AB+1,1:I=0
2520 S=S+10:F=F+1:POKE36877,0:GOTO50
3000 POKE36869,240:POKE36878,8
3010 PRINT"      YOU SCORED "S" POINTS AND
     TRAVELED "1600-U" MILES SHORT OF
     THE BASE"
3011 IFS>HITHENPRINT",BUT GOT THE HI-SCORE
3020 IFS>HITHENINPUT"NAME";P$:HI=S
3060 RESTORE:S=0:POKE36869,255:POKE36876,0:
     POKE36875,0:GOTO12
3100 F=F-.5:FORAB=1TO22*20STEP23
3101 IFPEEK(7878+D+AB)=206ORPEEK(7878+D+AB)
     =205THENPOKE7878+D+AB-23,32:GOTO50
3102 IFPEEK(7878+D+AB)=1THENPOKE7878+D+AB-
     23,32:GOTO2500
3103 IFPEEK(7878+D+AB+22)=1THENPOKE7878+D+
     AB+22,32:POKE7878+D+AB-23,32:GOTO2500
3104 IFPEEK(7878+D+AB-1)=206THENPOKE7878+D+
     AB-23,32:GOTO50
3110 POKE7878+D+AB,2:POKE7878+D+AB-23,32:
     POKE7878+D,0
3200 NEXT:GOTO50
```

Defender
by Jonathan Thompson

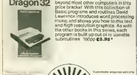
Better books from Sunshine



A collection of sophisticated Basic programs and subroutines including Unifile, Renumber (handles Gotos and Gosubs) education, accounts games and scores of essential routines. Put your Spectrum to work with what must be the most comprehensive Spectrum book 248pp **£5.95***



Some of the more advanced programs in this collection include a word processor and text editor a music and sound synthesiser, a sprite editor and a program which allows you to enter high resolution graphics mode. This is not available in the standard Basic 160pp **£5.95***



This computer has capabilities far beyond most other computers in this price bracket. With this collection of Basic programs and routines David Lawrence introduces word processing music and shows you how to mix text and high resolution graphics. As with the other books in this series, each program is built up out of re-useable subroutines 160pp **£5.95***

Trade/dealer enquiries welcome



SUNSHINE

Please send me
- [ ] The Working Spectrum at £5.95 each
- [ ] The Working Commodore 64 at £5.95 each
- [ ] The Working Dragon 32 at £5.95 each

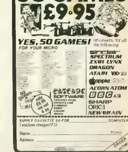
I enclose a cheque/postal order for £ ______
payable to **Sunshine Books** 19 Whitcomb Street London WC2 7HF

Name ______

Address ______

Signed ______

We aim to mail deliver in four to five days



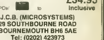


DRAGON 32
SOUND EXTENSION MODULE

- Fully cased Module plugs into cartridge port
- Provides 3 channels of sound. 3-note chords and harmonies over 5 octaves
- Uses new BASIC command. No need to Peek or Poke
- Many built-in sound effects (e.g. bomb, laser)
- Music and graphics can occur together without loss of speed
- Based on popular well-proven sound generator
- Two Input/Output ports included
- User manual provided with examples

ONLY **£34.95** inclusive

Cheques/POs/ to



J.C.B. (MICROSYSTEMS)
29 SOUTHBOURNE ROAD
BOURNEMOUTH BH6 5AE
Tel: (0202) 423973

Write or phone for further details

Documentary

on Spectrum

This games program for the 16K ZX Spectrum is a spin-off of a game I saw in another magazine for the Commodore 64

It involved shooting down three different types of dangerous 'space waste' which constantly fall towards your planet under its gravitational pull

You must shoot down this waste before it reaches your planet and reduces your population

The waste takes on the form of three different shapes the first is a runaway bomb which will take out 250 people so is only worth 10 points The second is an old space ship rolling through space if hit it is worth 20 points and will kill 500 people The final piece is an anti matter crystal which could kill 750 people but is worth only 30 points

At the start of the game you are given two laser bolts and two each time you hit a piece of waste

Program notes

Lines	
90-130	Move your spacecraft and check if you are dead
200-280	Fire your laser bolts
300-310	Blow up the waste
800-830	Reduce lives
900-910	Initialise and categorise type of waste
1000-1040	Move the waste — this is the main part of the game
1050-1060	The waste has reached your planet
9000-9100	Set UDG initialise variables set up screen
9900-	You have been blown up three times PRINT results end game

Graphics

Line	
100	L
9060	ABCD EFGH IJKL

PROGRAM OF THE WEEK

```
   1 PRINT AT 11,0; FLASH 1;"THE
FIRST SHOT IS IMPORTANT....."
   2 PAUSE 100
   6 INK 7: PAPER 0: BRIGHT 1: B
ORDER 0: CLS
  10 GO SUB 9000
  20 GO TO 1000
  80 IF ATTR (x,y+1)<63 THEN GO
TO 800
 100 LET y=y+(INKEY$="2" AND y<2
8)-(INKEY$="1" AND y>1): PRINT A
T x,y;"L"
 120 IF INKEY$="" THEN GO SUB 2
00
 130 RETURN
 200 IF shs=0 THEN RETURN
 201 LET shs=shs-1
 210 LET sho=(y+2)*8+5
 220 PLOT sho,32
 230 DRAW OVER 1;0,130
 240 BEEP .01,20
 250 PLOT OVER 1;sho,162: DRAW O
VER 1;0,-130
 270 IF SCREEN$ (g,y+1)="" AND g
<18 THEN GO TO 300
 280 RETURN
 300 FOR w=5 TO -5 STEP -1: BEEP
 .01,w: PRINT AT g,y+1; OVER 1;C
HR$ (RND*30+32): NEXT w: PRINT A
T g,y+1;" "
 301 LET shs=shs+2
 310 LET sc=sc+(c*10): GO TO 900
 800 FOR g=40 TO 0 STEP -5: BEEP
 .08,g: NEXT g: PRINT AT 7,y;
" ": LET lives=lives-1: IF lives=
0 THEN GO TO 9900
 801 PRINT AT 18,yy;" ";AT 19,yy
;" "
 820 PRINT AT 0,20;"     ": PRINT
 AT 0,28;: FOR d=1 TO lives: PRI
NT INVERSE 1;"L";: NEXT d
 830 PRINT AT 3,30; INVERSE 1;"
"
 900 IF c=3 THEN LET c=0
 901 LET c=c+1: LET x$=a$(c): LE
T yy=RND*27+2
 910 PRINT AT 0,0; [redacted]
1000 FOR g=2 TO 20
1001 IF pop<=0 THEN GO TO 9900
1005 PRINT AT 0,2; INVERSE 1;"Sc
ore ";sc;AT 0,12;"Population ";p
op
1010 LET f=f+1
1015 IF f=5 THEN LET f=1
1020 PRINT OVER 1;AT g,yy; BRIGH
T 0;x$(f); BRIGHT 0;AT g-1,yy;x$
(f1)
1022 IF g=2 THEN PRINT AT 1,yy;
"
1025 LET f1=f
1030 GO SUB 80
1040 NEXT g
1050 LET pop=pop-c*250
1055 BEEP .5,-20: RESTORE : FOR
p=0 TO 12: READ ww,www: BEEP ww/
750,www-10: NEXT p
1056 PRINT AT 20,yy; OVER 1;x$(f
)
1060 GO TO 900
8000 REM ************************
9000 FOR g=32600 TO USR "L"+7
9010 READ a: POKE g,a: NEXT g
9020 DATA 31,17,240,153,159,136,
248,0,16,16,16,16,0,3,2,3,240,13
6,136,189,249,17,17,31,8,8,8,8,1
6,16,16,16
9030 DATA 24,255,126,60,24,24,24
,0,0,0,1,255,128,0,0,0,0,24,24,2
4,60,126,255,24,0,0,0,128,255,1,
0,0
9040 DATA 126,70,74,82,98,126,0,
0,16,56,84,146,84,56,16,0,126,98
,82,74,70,126,0,0
9045 DATA 16,16,56,126,254,136,5
6,254
9050 DIM a$(3,4)
9051 LET pop=5000
9052 PLOT 0,0: DRAW 255,0,-.3
9053 LET lives=3
9055 LET shs=2
9060 LET a$(1)="ABCD": LET a$(2)
="EFGH": LET a$(3)="IJKL"
9065 LET c=1: LET x$=a$(c)
9070 LET yy=RND*27+2: LET x=18:
LET y=13
9080 LET sc=0: LET hs=1000
9090 LET lives=3
9091 PRINT AT 0,0; INVERSE 1;"
"
9092 PLOT 0,0: DRAW 255,0: DRAW
0,175: PLOT 0,0: DRAW 0,175
9095 LET f=1
9098 FOR d=1 TO lives: PRINT AT
0,28+d;"L": NEXT d
9099 LET f1=f
9100 RETURN
9900 LET w=y*8+12: FOR g=0 TO 10
0: PLOT w,20: DRAW RND*23,g: PLO
T w,20: DRAW -RND*23,g: NEXT g
9910 PRINT AT 3,1;"YOU HAVE LET
THE SPACE-WASTE-''       DESTROY
 YOUR PLANET''          YOU HAVE S
CORED ";sc
9920 IF pop<2500 AND pop>0 THEN
PRINT ''"YOUR POPULATION HAS BEE
N GREATLY''  DECREASED,BUT THEY
 HAVE ALL''      EVACUATED SAFE
LY"
9930 IF pop>=2500 THEN PRINT ''"
  POPULATION IS NEARLY INTACT"''"
    BUT EVACUATION WAS SLOW ''"
    YOU MAY HOLD YOURSELF ''"
       RESPONSIBLE"
9940 IF pop=0 THEN PRINT "    YO
U ARE RESPONSIBLE FOR THE ''' D
EATHS OF 5000 INHABITANTS
 OF YOUR HOME PLANET"
9950 FOR g=0 TO 2500: IF INKEY$=
"" THEN NEXT g
9960 RUN

*************************************
** SPACE-WASTE © D.J.P. 1983 **
*************************************
```

Documentary
by David Parkinson

Globe

on BBC

This program can be used to draw a planet in space and then to create the illusion of rotation. This is done in several procedures.

Procstars – Plots 100 stars in random positions in space
Procplanet – Draws in the background
Proclongitude – Draws lines of 'longitude' in colours 7-15 on the planet's background
Procring – Draws a ring around the planet
Procrotate – Changes the actual colours of the longitude lines in sequence to produce the impression of rotation.
Fnk and *Fny* – Offsets the planet's axis (See below)

To save time the sine and cosine values are stored in arrays in lines 40 — 100 so that they will not have to be calculated more than once in the program; this means that there will be a pause when the program is run so do not be alarmed! To make the planet look more realistic the two functions at the end of the program are used to make it seem as though it is revolving about a non horizontal axis.

```
:VDU1,27,1,0: GLOBE (c) 1983
>L
   10      REMOVE THESE OUT
   20    REMEMBER JAMES JACKSON'S
   30 MODE2
   40 DIM S(90),C(90)
   50 A%=-1
   60 R%=400
   70 FOR A=0 TO RAD360 STEP RAD4
   80   A%=A%+1
   90   S(A%)=SIN(A):C(A%)=COS(A)
  100   NEXT
  110 VDU23;8202;0;0;0;
  120 VDU19,0,4;0;
  130 VDU19,4,7;0;
  140 VDU19,7,0;0;
  150 PROCSTARS
  160 PROCPLANET
  170 PROCLONGITUDE
  180 PROCRING
  190 REPEAT
  200   PROCROTATE
  210   UNTIL FALSE
  220
  230 DEF PROCSTARS
  240 GCOL 0,3
  250 FOR T%=0 TO 100
  260   PLOT69,RND(1279),RND(1023)
  270   NEXT
  280 ENDPROC
  290
  300 DEF PROCPLANET
  310 VDU29,640;512;
  320 GCOL 0,2
  330 MOVE 0,0
  340 FOR A%=0 TO 90 STEP2
  350   MOVE 0,0
  360   PLOT85,S(A%)*R%,C(A%)*R%
  370   NEXT
  380 ENDPROC
  390
  400 DEF PROCLONGITUDE
  410 C%=6
  420 FOR L%=0 TO 45
  430   C%=C%+1
  440   IF C%=16 THEN C%=7
  450   GCOL 0,C%
  460   FOR A%=0 TO 45 STEP 3
  470     X=S(A%)*C(L%)*R%
  480     Y=C(A%)*R%
  490     IF A% THEN K%=5 ELSE K%=4
  500     PLOT K%,FNX,FNY
  510     NEXT
  520   NEXT
  530 ENDPROC
  540
  550 DEF PROCRING
  560 GCOL 0,4
  570 FOR W%=500 TO 572 STEP 8
  580   FOR R%=36 TO 99 STEP 3
  590     A%=R% MOD 90
  600     IF R%=36 THEN K%=4 ELSE K%=5
  610     X=C(A%)*W%
  620     Y=S(A%)*100
  630     PLOT K%,FNX,FNY
  640     NEXT
  650   NEXT
  660 ENDPROC
  670
  680 DEF PROCROTATE
  690 FOR C%=7 TO 15
  700   VDU 19,C%,7;0;
  710   WAIT=INKEY(10)
  720   VDU 19,C%,2;0;
  730   NEXT
  740 ENDPROC
  750
  760 DEFFNX=(0.9*X)+(-0.4*Y)
  770 DEFFNY=(0.4*X)+(0.9*Y)
```

Globe
by James Jackson

Break the Code

on Vic20

This is a version of the 'Mastermind' game with a slight difference. Not only must you guess the colour combination within 10 moves but also within a time-limit.

There are four levels of play, 4 being the easiest. To make the game easier or harder just change the times in lines 620-650. To input your choice use the colour keys, cyan and blue are not used in the game. After you have put in your guess you will have a chance to change it.

The Computer's response to your guess is as follows: For every black square you have a correct colour in the right place; for every white square you have a correct colour in the wrong place.

Program notes

10	Re-seeds random generator
110 140	Computer picks code
180 340	Input guess
350 390	Checks choice against code
500	Times up
530 540	Music routine if right or wrong
600-660	Time-limit routine

```
10 L=RND(-TI)
20 C=7732 D=7690 G=7741 J=30720 K=7734
30 M=36876 N=36876 O=36874 KK=36877 RR=0
40 POKE36879,59 PRINT"♥"
50 PRINT"XXXXXXBREAK THE CODE■"
60 PRINT"XXXXXXBY KEN ADNAMS"
70 PRINT"XXXXXXXPRESS SPACE"
80 GETG$ IFG$<>" "THEN80
90 PRINT"XXXXXINPUT LEVEL (4-1)"
100 GOSUB600
110 PRINT"♥" FORI=0TO3
120 A(I)=INT(RND(1)*8)
130 IFA(I)=3ORA(I)=6THEN120
140 NEXT
150 FORI=0TO6 POKED+I,102 POKED+I+J,2 NEXT
160 TI$="000000" FORI=48TO57 POKEC,I C=C+44 NEXT
```

```
170 PRINT"TIME "RIGHT$(TI$,3) IFTI$>=B$THEN500
180 R=0 W=0 FORI=0TO3
190 GETC$(I) U(I)=VAL(C$(I))-1 PRINT"TIME
    "RIGHT$(TI$,3)
200 IFTI$>=B$THEN500
210 IFC$(I)="0"THENN250
220 IFU(I)=-1THEN190
230 IFU(I)>7ORU(I)<0ORU(I)=3ORU(I)=6THEN250
240 GOTO260
250 PRINT"ERROR" FORT=0TO750 NEXT PRINT"
    " GOTO190
260 POKEN,15 POKEN,203 FORT=0TO10 NEXT POKEN,0
270 POKEK,81 POKEK+J,U(I) K=K+2 NEXT
280 PRINT"OK?" PRINT"Y/N"
290 GETG$ PRINT"TIME "RIGHT$(TI$,3) IFTI$>=
    B$THEN500
300 IFG$="Y"THEN350
310 IFG$<>"N"THEN290
320 PRINT"        " PRINT"    "
330 FORT=0TO6 POKEK+T-8,32 NEXT K=K-8
340 POKEM,7 POKEKK,203 FORT=0TO100 NEXT POKEKK,
    0 GOTO170
350 FORP=0TO3 X(P)=A(P) NEXT
360 FORI=0TO3 IFU(I)=X(I)THENR=R+1 X(I)=20
    U(I)=10
370 NEXT
380 FORI=0TO3 FORZ=0TO3 IFU(I)<>X(Z)THENNEXTZ
    NEXTI GOTO400
390 W=W+1 X(Z)=20 NEXTI
400 IFR=4THEN510
410 IFR=0ANDW=0THENPOKEO+1,14 POKEG+2,15 POKED+3
    ,14 POKED+4,5 FORI=1TO4 POKED+I+
J,2 NEXT
420 IFR=0THEN440
430 FORT=1TOR POKEG+T,123 POKEG+T+J,0 POKED,196
    FORL=0TO5 NEXT POKED,0 NEXT
440 IFW=0THEN460
450 FORT=1TOW POKEG+T+R,123 POKEG+T+R+J,1 POKED,
    182 FORL=0TO5 NEXT POKED,0 NEXT
460 K=K+36 G=G+44
470 IFTI$>=B$THEN500
480 IFK>8164THENRR=1 GOTO510
490 PRINT"        " PRINT"    " GOTO170
500 PRINT"TIMES UP" RR=1
510 FORI=0TO3 POKED,81 POKED+J,A(I) POKED+1,32
    D=D+2 NEXT
520 IFRR<>1THEN540
530 FORI=255TO128STEP-1 POKEM 10 POKED,I FORT=
    0TO5 NEXT NEXT POKED,0 GOTO550
540 FORI=128TO255 POKEM,10 POKEN,I FORT=0TO5
    NEXT NEXT POKEN,0
550 PRINT"ANYMORE ?
    (Y/N)"
560 GETG$ IFG$="Y"THEN10
570 IFG$<>"N"THEN560
580 PRINT"" END
600 GETL$ B=VAL(L$) ONBGOTO620,630,640,650
610 GOTO600
620 B$="000230" RETURN
630 B$="000300" RETURN
640 B$="000400" RETURN
650 B$="000500" RETURN
```

Break the Code
by Ken Adrians

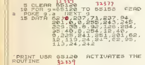
Left-handed

on Spectrum

This is a machine code routine for the ZX Spectrum. The idea came to me when I had injured my left hand and was forced to use the keyboard one handed. I discovered that I could not use delete — the shift and zero keys were too far apart. This routine allows you to use the Symbol shift and zero keys instead — much more simple. The idea could be extended: the same method could be used to redefine the *Edit* key as Enter, and make your programs uneditable.

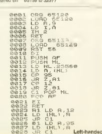
An assembly listing is included so you can experiment with it. It was entered on the Bug-Byte Aspect assembler, so if you own this program you can type the listing in straight away.

Please note that this single handed Delete uses the interrupts on the 48K Spectrum. To use the routine on a 16K machine, change the second byte of code from 9 to 40, the 65120 to 32339 and the 65158 to 32377.



```
  5 CLEAR 65120
 10 FOR g=65120 TO 65158: READ
a: POKE g,a: NEXT g
 15 DATA 62,9,237,71,237,94,
    201,0,0,255,243,245,
    229,33,8,92,126,254,
    95,40,8,254,12,40,
    9,225,241,251,201,62,
    12,119,24,247,62,95,
    119,24,242

PRINT USR 65120  ACTIVATES THE
ROUTINE
```

```
0001 ORG 65120
0002 LOAD 65120
0003 LD A,9
0004 LD I,A
0005 IM 2
0006 RET
0007 ORG 65129
0008 LOAD 65129
0009 RST 56
0010 DI
0011 PUSH AF
0012 PUSH HL
0013 LD HL,23560
0014 LD A,(HL)
0015 CP 95
0016 JR Z,A1
0017 CP 12
0018 JR Z,B1
0019 C1 POP HL
0020 POP AF
0021 EI
0022 RET
0023 A1 LD A,12
0024 LD (HL),A
0025 JP C1
0026 B1 LD A,95
0027 LD (HL),A
0028 JR C1
0029 END
```

Left-handed
by Bill Langley


HORNET
SOFTWARE LTD
FOR THE
DRAGON 32 & TSR80 CO-CO
A BRAND NEW MACHINE CODE GAME IN THE UK
WORMTUBE
FROM ZETA
1 to 4 players — 9 speed/skill levels — Joystick Control — Pause Control — Arcade style action and sound — Wormtube has Rainbow certification seal and was reviewed in March 83 Rainbow as a well conceived game with great graphics and strong sound effects
£8.00
HORNET SOFTWARE LTD
10 BUCKINGHAM'S WAY, SHARNFORD
LEICS, LE10 3PX. TEL: 0455 272037
MORE GAMES TO BE RELEASED SOON
TRADE ENQUIRIES WELCOME
GOOD ROYALTIES PAID FOR DRAGON M/C SOFTWARE
DRAGON SOFTWARE
all machine code
BORKA
NO JOYSTICKS NEEDED
SUPPLIED ON CASSETTE
DOTZ
3 ON ONE CASSETTE
EDITOR ASSEMBLER – MONITOR
SUPPLIED ON CASSETTE WITH USER INFORMATION
DISASSEMBLER
SOLD ON CASSETTE
SPECIAL OFFER
Cost of both on one purchase
SUPPLIED ON CASSETTE
CHESS
Supports CASTLING AND EN PASSANT
SUPPLIED ON CASSETTE
VULTURES — NEW
FAST MOVING GALAXIAN TYPE GAME
SUPPLIED ON CASSETTE
Cheques/POs payable to
J. MORRISON (MICROS) LTD
ALL ORDERS DESPATCHED BY RETURN FIRST CLASS POST
Callers and Trade enquiries welcome
J. MORRISON (MICROS)
NOW YOU CAN LIFT STATIC DRAWINGS, PHOTOGRAPHS, ETC, RIGHT OFF THE PAPER AND BRING THEM TO LIFE INTO YOUR PROGRAM!
TWO POTENT FEATURES COMBINE TO BRING YOU UNIQUE NEW POWER OVER YOUR SPECTRUM GRAPHICS!
FROM PAPER TO SCREEN...
...AND INTO YOUR PROGRAM.
POWER GRAPHICS
ACTION-TRACER + GHOST-WRITER
ACTION-TRACER
GHOST-WRITER
TOGETHER THEY'RE DYNAMIC!
FULL CONTROL!
ZX SPECTRUM
FOR 16K OR 48K
ONLY £8 95
BUTTERCRAFT
14 Western Avenue, Riddlesden, Keighley, Yorks, ENGLAND
PLEASE ASK FOR OUR ILLUSTRATED LIST OF GUARANTEED QUALITY TRS80/VIDEO GENIE SOFTWARE
OVERSEAS CUSTOMERS ADD £1 00 EXCESS POSTAGE

Snoopy
on ZX81

For all of you with ZX printers here is a program to utilise them and set pleasing results If necessary a small message could be added in line 165 The program could be converted for the Vic20 by removing the L s from *Lprint* and adding

```
6   OPEN1 4 CMD1
169 PRINT#1 CLOSE1
```

```
5 REM SNOOPY PRINT
10 LPRINT "                  ++*+"
20 LPRINT "                     ''■"
30 LPRINT "                     (@ @'----."
40 LPRINT "            *                    .*"
50 LPRINT "           .**■               '''    )"
60 LPRINT "           *++++■             *++    )"
70 LPRINT "           +***+      (               *"
80 LPRINT "           ■+++./--■   ■---)-*"
90 LPRINT "            '+;         ) ,"
100 LPRINT "                    A+A"
110 LPRINT "                    )   ■"
120 LPRINT "                  ')      )"
130 LPRINT "                + ) I /"
140 LPRINT "              --( I I--,--,"
150 LPRINT "             (++(-(   ) ))+))"
160 LPRINT "             ''II'   *---+"
170 END
```

Snoopy
by M Valentine

Tony Bridge's Adventure Corner

Summer games!

By the time you read this many of you will have finished your exams — you lucky devils! So you will now be crawling back into the daylight and looking for a good adventure program to keep you amused throughout the summer months To bring you up to date with what the rest of the world has been up to lately here are my personal top adventures

(1) *The Hobbit* — for changing overnight, the face of Spectrum adventuring Melbourne House the publisher of this by-now classic game should rectify some of the irritating little bugs in the program which they must be well aware of by now More importantly versions for the other popular micros should be released — they can t lose

(2) *The Scott Adams Adventure Series* — for the Vic20, Texas and other machines There is the Willie Crow ther Don Woods classic for mainframe computers but this series is the clas sic for home micros Set purely in text they pose good problems with a high degree of difficulty all set in an im aginative scenario Titles include *Voodoo Castle Strange Odyssey* and *The Count*

(3) The Level 9 trio — *Colossal Adventure Adventure Quest* and *Dungeon Adventure* The first of these is a version of the Crowther Woods origin al, but with a much expanded en dgame The other two start from loca tions within the first thus making an impressive suite of adventures They are always a pleasure to play not least because of the comprehensive and well-produced documentation which even include a SAE which you may use to ask for *Help* in desperation

(4) *Pimania* from Automata — not one of my personal favourites (I don t think the humour of their lovely adverts translates well to the micro adventure) this program nevertheless deserves a place in this survey because it intro duced the idea of a prize for the first person to crack the puzzles of the game Pimania s Golden Sundial thus follows the book world s Golden Rab bit from *Masquerade* into the history books And nobody s found it yet!

(5) *Madness and the Minatour* — from Dragon Data for the Dragon It s here because after *The Hobbit* and the *Scott Adams* series this is the one I've had most enquiries about While diffi culty is not the ultimate criterion of a good adventure this one, as Michael Vesey of Worksop can verify is crack-able He has written asking what all the fuss is about, as he has no problem in finding the mushroom

(6) Just about any adventure for the Atari machines There are not many text programs and those available are fairly standard, but in keeping with the Atari s graphic capabilities the arcade adventures are really special and can be highly recommended Representa-tive are *Ghost Encounters The Pharaoh s Curse Action Quest* and *Jour ney to the Planets*

(7) *Artic Adventures A-E* — these are all of a similar format pure text unble-mished by graphics I get many letters asking for help with these programs and while difficulty may not be the prerequisite of a good adventure these games are extremely compelling

(8) Last but not least is a graphic adven-ture that I come back to again and again — *Volcanic Dungeon* from Car-nell Available for the ZX81 and the Spectrum this has good documenta tion which includes a map of the dungeon Combining elements of *D & D* and the old favourite *Wumpus* it can be played again and again

So there is a quick survey of programs that you are likely to enjoy But please write and let me know of your own particu lar favourites.

Now a hopeful look forward to pack-ages we would all like to see! First off — *Lord of the Rings* from Melbourne House all 89 parts of it I don t know the legal aspect of this, but if MH have the rights they must surely be working on the epic

Then Artic s Adventure F — and please Artic how about just a touch of colour? And, while we're about it how about versions for other micros?

Finally, *Valhalla*, from Microl — a prog ram that, according to the publisher will knock *The Hobbit* from its pride of place The graphics and game mechanics are apparently superb ■

NB All entries for the Adventure Competition must reach us by 30 June

This series of articles is designed for novice and experienced Adventurers alike Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter So if you have an Adventure you want reviewed or if you are stuck in an Adventure and cannot progress any further write to Tony Bridge Adventure Corner *Popular Computing Weekly* Hobhouse Court 19 Whitcomb Street, London WC2 7HF

Cruising & Blind Alley

£10 to be won

Can you beat the new high score?

Cruising

First there was *Space Invaders* then there was *Pacman* – now there is *Cruising* This all-action machine code arcade type game will test your powers of co ordination to the limit Never before has a game asked you to think so quickly or move so fast

Achieving a high score on *Cruising* takes considerable skill and not a little patience

Popular Computing Weekly is offering £10 each month to the player with the highest score on *Cruising* All you have to do to enter this month s competition is send a print-out of your highest score together with your name and address to

Popular Computing Weekly
Cruising
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the *Cruising* challenge?

The winner of last month s competition with a score of 22864 was I C Willis of Shore Lane Sheffield who receives £10 Entries for this month s competition close on June 30

Notes

1) Each entry must consist of a ZX printout and your name and address
2) Closing date for this month s *Cruising* challenge entries is June 30
3) The highest score each month will receive £10
4) High scores cannot be transferred from one month to another
5) The judges decision is final
6) No employees of Sunshine Publications Ltd or their families will be eligible to enter

Blind Alley

Blind Alley is a game of strategy In order to win you must outwit the computer using your craft to fence in and finally destroy the enemy pursuit vehicles But watch out for the solid trail left by your opponents — one touch is fatal!

Each month *Popular Computing Weekly* is giving away £10 to the player with the highest score on *Blind Alley* To enter this month s competition simply send in a copy of your score and the code at the bottom of the score table together with your name and address to

Popular Computing Weekly
Blind Alley
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

The highest score sent in so far this month is 70625 from Stuart Williamson of Bradford West Yorks Entries for this month s competition close on June 30

DIFFICULT CALL

David Parkinson of Woodcote Road Tattenhall Wog verhampton writes

Q I have recently acquired a book on Z80 machine code for the Spectrum. I am having difficulty in understanding the Mnemonic *Call*

Is it the machine language equivalent of the Basic instruction *Usr*? Also, could you explain how the command could be used in an M/C Invaders type program?

A The mnemonic *Call* is very similar to the Basic command *Gosub* and it can be used conditionally or unconditionally. It is used along with the mnemonic RET which is *Return* in BASIC. In effect what happens when you use *Call* is that you *Push* the return address on to the top of the stack and then *Jump* to the address you have *Called*.

The instruction does not alter the flags but it is important that you leave the RET address on top of the stack so you can return. This means that any further numbers put on to the stack by the routine you have *Called* must be *Pushed* off again.

I cannot say with any certainty how you could use *Call* in your particular program because I have not seen it. However I would presume that it would be used unconditionally to set up each new screen and conditionally to check such things as hits and damage to the shields.

LACK OF MEMORY

P D Austin of Weston Park Court Bath writes

Q My interest having been much revived by the arrival of the office mini computer, I recently dragged my old ZX80 out of retirement. But I have become frustrated by the lack of memory, though I am still loathe to give it to the dustman — after all, it did cost £100 in 1980.

However, I have been told by Sinclair that the Ram pack needs the new Rom, is this so? If it is, do you know of anyone who can supply any sort of Ram add on for the ZX80, however small?

A I am very surprised at the response from Sinclair. Unless they have made some sort of change in their later Ram packs there should be no problem on any ZX80. The only difficulties that might occur are with the old 3K add on that has not been available for some time. Just to check I used my old (did *that* really cost £100) ZX80 with a Big Byte Ram pack and found no problems. I suggest that you buy a Ram pack from a shop, explaining the situation and asking if you can have a refund in the event that it does not work.

COMPUTER STUDIES

Steve Spencer of Braddon near Towcester Northants writes

Q I shall be taking my 'O' levels soon and I wish to go to a sixth form college to do computer studies next year. As I am unaware of the sort of jobs available in computing, I would be grateful if you could print a couple of useful addresses that I could write to for more information.

A This is the sort of question that requires an article in its own right. The best place to start is probably a careers officer and you will find one attached to your sixth form college.

The range of computer related jobs is large and getting larger. Every big company today has a computing department — in some cases it only deals with one particular aspect of the work, in others a computerised system will be found at all levels for use in all sorts of applications.

The number and range of computers in business is going to increase. People will be wanted to write, maintain and update the programs.

Letters to all the big companies in your area will probably produce results. Some companies might well take you on as a trainee once you have done the basic exams at college, others might want you to do further exams.

SPARE 32K

Sean Conelly of Valley Road Macclesfield Cheshire writes

Q I have put 64K Hitachi Drams into my Spectrum, to make it 48K. I would like to know how to use the other 32K I have spare. I know that it would have to be switched in and out, but any advice on how to do this would be useful.

A The circuitry to do this is quite complex — and I have no detailed information. The only thing I can suggest is that you should contact someone like East London Robotics who offers a 64K memory add on for the Spectrum. They might be willing to sell you the circuit board or the plans separately.

Sean also asked about a program he sent in. From the copy it seems that he is missing a data statement. The data is read by a line *For N = 1 to 10* the problem is that you only have nine data statements. As it is about resistor colour codes it is probably green that is missing between yellow and blue.

FUZZY ZX80

Peter King of Manor Gardens, Saxmundham, Suffolk writes

Q I own a Sinclair ZX80. Sometimes when I turn it on, the screen goes fuzzy and the computer will not respond to the keyboard. This also happens when I am typing in a long program. Is there anything that I can do about this? Also, do you know if any ZX80 software is being produced?

A From my mailbag there are still a surprising number of ZX80s in use up and down the country. Your problem could be one of two things — are you using a Ram pack? This used to cause a lot of problems on the ZX80, because as soon as the contacts got dirty between the Ram pack and the port it would cause a crash. The answer to this is to clean the port with some spirit or industrial alcohol.

The second possible cause of your problems is overheating. This is much harder to cure — keeping something cold on the top was the usual solution. But beware that you do not get any water into the computer!

The other possible modification is to cut slots into the left side of the case above the heat sink. More dedicated/frustrated owners have successfully got round the problem by literally enlarging the heat sink. This is usually done by cutting out the side of the case above the heat sink and screwing on a piece of copper or brass that then sticks through the gap.

On my ZX80 I used two pieces of thick copper wire that I had beaten flat. Unsubtle but quite effective.

The problem you sometimes face when you power up at the start could be to do with the restart line. A capacitor between this line and the 0 line will ensure that you get an even pulse and will slow the restart down enough to cut out any sudden peaks that can occur when powering up. The capacitor needs to be 25v 100 microfarads.

As for ZX80 software I doubt whether much is still being produced — I certainly have not seen any advertisements for a long while. The only thing that I can suggest is that you scan the small ads in some of the magazines to see if any turn up. If this fails you could always try placing your own small ad.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, *PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

CLASSIFIED

Semi-display — £5 per single cc
Trade lineage — 20p per word
Private lineage — 10p per word

CALL *DIANE DAVIS* ON *01-839 2476* FOR SEMI-DISPLAY ADVERTISING

GAMES SOFTWARE

SPECTRUM PROGRAMS

SPECTRUM GOLF BY R+R
16K — £3 75 INC
One or two players, nine or 18-hole course, fairway, rough, green, bunkers, trees and water hazards. Each course different.

SPECTRUM MICRO CHESS BY ARTIC
16K — £6 95 INC
Accepts all legal moves en passant, castling and promotes a pawn to queen.

MURDER ON SPEC BY MICROJUICE
16K — £5 30
Ingenious murder game in which you are the ...

Mail order only. Send cheques, POs to:
VYAJYS H-K 11 Margaret Avenue
St Austell Cornwall
(or SAE for list)
Tel: St Austell 61797

SPECTRUM 16/48K Money Run multi level game £3. Cheques or postal orders to A Lee 10 Foxdale Avenue Sheffield S12 2FQ

ALLIGATOR CROSSING new ZX Spectrum 16-48K game of skill. Send £4 50 to 23rd Century Software, Aalsmeer, Old Road East, Gravesend Kent DA12 1NO

JUPITER ACE SOFTWARE Cassette JA1 three-games for the unexpanded Ace £3. Cassette JA2 a 19K graphic adventure £6 from R Roberts 52 Whalesmead Road, Bishopstoke, Eastleigh Hants SO5 6HL

SPECTRUM 16K Renquel presents her games for age 16 and over only (State age when ordering) Sell only £2 95 Brooks 17 Malvern Sutton Road Southend Essex

COMMODORE 64
Up to 40 per cent off. Best sellers latest tapes £5.99 each inc VAT p&p. Gridrunner 1, Gridrunner 2, Attack of the Mutant Camel, Meter Mania, Renaissance, Frogger, Panic, Scramble, Sprite Man, Krazy Kong, Pakacuda, Cyclons, Monopole. Cheques POs to Crashmail 40-45 New Broad Street London EC2. Tel 01 740 0487. Mail order only.

ORIC 1 MONEY SPIRAL and Gold Hunter £2 60 Vic20 Puckman £2. O J Wyatt 77 Redgrave Gardens Luton Beds

ZX81 (16K) Poker, Brag and Dominoes on cassette. Any pair £2 35 from W Jefferson 29 Arundel Walk Pelton Chester-le-Street County Durham

VIC20 PREMIERE SOFTWARE hi res action with Pacball with Clever Ghosts! Bricky with Trickball. Frooty with hold nudge graphics creator (hi res) and more only £5. The Anchor, South Somercotes, Louth, Lincs LN11 7BL

SWAP Flight Simulation Trans Tower for Hobbit. Tel 0928 715158

DRAGON 32. Backgammon, Noughts and Crosses. Full graphics and sound £5 95 including p&p. S. Holt 2 Woodfall Astley Park Chorley Lancs

QUALITY ORIC SOFTWARE

THE WORD
Up market Hangman with ... and ...

DEATH TRAP
Moving graphics game with facility to design your own graphics

MASTERMYNDE
The fully expanded classic 1-4 players, multi skill levels — 1 intel

Tapes + instructions £4 85 each
SAE for full range and price list
Cheque/PO to: Heathfield Technology
Lock Street, Savile Town, Dewsbury
West Yorks WF12 9BW

LANCASHIRE MICROS

KEMPSTON JOYSTICK CONVERSION TAPE £4 95. Converts 3D-Tank, Escape, ... Horace, Panic, Haven of Evil and ... Simulation for use with Kempston joystick. **SPECTRUM GOLF** £3 95 ... graphic game for the 48K Spectrum. **ZOMBIES** UNEXPANDED VIC £3 95. Game of strategy ... are the zombies ... **AVAILABLE FROM LANCASHIRE MICROS 51 QUEEN ST MORECAMBE LANCS Tel (0524) 411435** DEALER ENQUIRIES WELCOME

ACE SOFTWARE Seven games for the unexpanded Jupiter Ace only £4. Federation Software 52 Rewley Crescent New Duston Northampton

DRAGON 32
ACE HIGH
One Spitfire's Battle of Britain. Destroy nine enemy planes and earn your Wings. 25 kills and you are the Ace. Up to ten minutes violent action.
High res graphics, cockpit view, radar monitor, 3D action, realistic sounds, reward system and detailed scoreboard. A quality 32K game. Not available in ... to libraries or club systems.
Part service £7 95 includes p&p.
TUDOR WILLIAMS
15 SUMMERHILL ROAD
BILSTON WV14 8RD

CHRISTINE COMPUTING
T99 4A SOFTWARE
NORTH SEA CODE BREAK
ASTRO-FIGHTER
£3.50 each. £6 50 for two. £9 for all three.
SAE for Hardware Software Catalogue to
Dept PCWK 6 Florence Close Watford Herts.

ZX81 16K Avoid colliding as you race around the maze while the other car tries to intercept. Fast machine-code action plus Hangman £3 50 J Riley 322 Bramhall Lane South Stockport, Cheshire

ESCAPE new graphics game for 16K Atari. Five levels cassette £5 Coulter 56 Grosvenor Road Epsom Downs Surrey

★ LYNX MUSIC MASTER ★
Now LYNX music is easy! Full two-octave stave on screen, compose, copy, replay, change tempo, etc. Cassette and full instructions £4 50.
ALBASOFT 140 Terregles Avenue Glasgow G41 4RR

VIC-STRIP adults only game for any expanded Vic20 tape £5 disk £10 includes p&p and Life Expectancy game. Pen Design 21 Langbar Close Bitterne Southampton SO2 7JH

BBC 32K GRAND PRIX Crackcode, Hangman, Tron, Connect 4. All graphics games £3 50 each including p&p Darren Graves 34 Stoke Lane Gedling

MISSILE. Defend your cities from the deadly onslaught. Graphics game for the BBC microcomputer (32K) only £5 inclusive to Paul Stevens 11 Woodhurst Close Cuxton Rochester Kent ME2 1LU

DETECTIVE, FOR 16K/48K SPECTRUM
For colour sound and high resolution graphics.
Pursue notorious Fingers McKee through Glasgow's Shady Streets and attempt an arrest before he escapes the city or you lose ... Your ... is made more difficult as he is a ... of thugs ... must be brought to justice!
Special introductory price of £4.50 + 50p p&p to Mr G Chapman, Brookmeads Ltd, Crondal Road, Exhall, Coventry.

VIC 20 SOFTWARE
All the Imagine Software Cassettes including Arcadia, Whacky Waiters, Catcha Snatcha, Frantic. All for either the expanded or unexpanded computer.
New for the ZX Spectrum, Jumping Jack
All at only £5 each!!
(inclusive of postage and packing)
Send cheques or POs to:
RULE COMPUTERS
30 Tylers Acre Road,
Corstorphine Edinburgh
EH12 7HZ
(Tel 031 334 7261)

FOR THE VIC20 from Arcsoft comes Zap Man. Hi res graphics, colour, sound, fast machine code action, all this for the unexpanded Vic for just £4.00 inclusive. Send cheque or PO for fast delivery to S. Fensome (Arcsoft) 73 Blackfriars Rushden Northants NN10 9PF

ORIC 1 48K Frenzic hi res graphics, on screen display of score, timer, lives lost, 4 skill levels, hi score feature, gears give total control over speed, full instructions supplied. Cheques PO for £3.25 (including p&p) to N Edwards 1 Chalfont Avenue Christchurch Dorset

CLASSIFIED ADVERTISING RATES:

Line by line For private individuals 10p per word minimum 10 words
For companies, traders and all commercial bodies 20p per word minimum 20 words

Semi-display £5 per single column centimetre minimum length 2 cm (Please supply A/W as PMT Or supply rough setting instructions.)

Conditions All copy for Classified section must be pre-paid. Cheques and postal orders should arrive at least two weeks before the publication date

If you wish to discuss your ad please ring Diane Davis 01 839 2476

Here's my classified ad.

(Please write your copy in capital letters on the lines below.)

		Please continue on a separate sheet of paper	

I make this .... words at .... per word so I owe you £ ....

Name ....

Address ....

Telephone ....

Please cut out and send this form to Classified Department *Popular Computing Weekly* Hobhouse Court 19 Whitcomb Street London WC2

LYNX 48K SOFTWARE
[illegible]
Space Time — [illegible]
£4.75 each inc p&p Cheques/P.O. to:
QUAZAR COMPUTING DEPT PCW
17 TEG CLOSE PORTSLADE SUSSEX

SPECTRUM SOFTWARE. 30 programs in one tape including Casino Piano Geography Midway Submarine for only £6 p&p included Dambly 10 Rue St Gertrude 1040 B[illegible]s Belg[illegible]

UTILITIES

SPECTRUM BACK-UP COPIER

[illegible] you need to back up [illegible] KEYSOFT present

THE KEY

100% machine code! Copies any type of program. Easy to use
Order THE KEY for any ZX Spectrum
Only £5.95
KEYSOFT Dept PCK
9 Essex Grove London N17 6RA
NB KEYSOFT advise users not to infringe the Copyright Act
Dealer Enquiries Welcome

TELETEXT ON YOUR SPECTRUM ZX [illegible] you create your own personal teletext system. Similar to Ceefax and Oracle. Capacity 900 pages. Full colour graphics flashing inverse video. 24 hour clock with alarm even the [illegible] — [illegible] Cassette £4.95 complete with sample system. Full instructions, also 12 month guarantee. Send cheque PO (or SAE for details) to Iain Stewart, 12 Torry Drive, Alva, Scotland FK12 5NG

SPECTRUM 'SNIFFER' reads tapes and prints out program name, length in bytes and start address. Machine Code and Basic. Also gives auto run line number. £2.50 from AWA, 50 Dundonald Road, Didsbury, Manchester

SPECTRUM 64 PRINT Amazing Software that gives 64 characters per line instead of 32, prints anything from your Basic program cassette. 48K or 16K, £3.50 K Ahmed 29 Magpie Hall Lane, B[illegible]

5D SOFTWARE

Z80A machine code programming for ZX81 16K
Two Cassettes plus Instruction Booklet, many examples and useable sub routines for your own program £17.50

Enquiries and cheques to [illegible] College [illegible] Diss Norfolk Tel [illegible]

BBC (A/B) KOPYKAT Simple effective routine to back up machine programs. Send £1 + SAE to M A Pond 98 Woodburn Manor Park, Wooburn Green, Bucks

TARS COPIER — copies virtually all Spectrum programs (16/48K). Verifies multiple copies. Two versions on cassette (one uses no program area). Money back guarantee. L Evans 16 Stonepit Drive, Cottingham, Market Harborough, Leics

SPECTRUM SERIES 2 reset and call monitor modification, instructions £1.50 J M Ansley 42 Falkland Court Braintree Essex CM7 8LL

DATAFILE 48K SPECTRUM 200 entries of three lines, storage retrieval, alpha numeric sort, plus search and printer facility for listings. Only £3.50 inclusive. Ashleysoft 36 Glenluce Road London SE3 7SB

BBC B TWO UTILITIES plus game. Mortgage: gives complete statement over any period. Graphic: enables 8 × 8 or 16 × 16 character definition. Pelmanism: game for up to four players. Cassette £5. Listings £3. V Hayles 44 Castleview Road Slough Berks

NEWBRAIN High resolution character generator creates up to 256 symbols for easy use in your Basic or m/c programs £5.95. Also full Z80 Disassembler in Hex Decimal allowing hard copy screen dump £4.50. From C Dixon 57 Marine Parade Brighton

ZX81 COPIER Lets you stop study copy any ZX81 program on cassette £2.50 Robker 28 Chadderton Drive Unsworth Bury Lancs

SPECTRUM KOPYKAT £4.95
100% machine code. Enables almost any ZX Spectrum program or data file to be backed up on to a fresh tape.
Programs over 41.5K (9.7K for 16K models) can now be copied with ease.
Plus FREE Tape-header Reader program. Both programs on one cassette. Only £4.95
IMMEDIATE DESPATCH. Send cheque/PO to:
MEDSOFT
61 Ariens Road, Doncaster DN2 6[illegible]
IT CAN EVEN COPY ITSELF

AUTOMATIC line numbering program for any Vic20. This 100 per cent machine code program is quick and easy to use. Cassette with instructions £2. From S Pendry 85 Stonewood Bean Dartford Kent

SPECTRUM KOPYCAT Make security copies of your favourite programs. Copies any Spectrum tape file 16/48K. Easy to use. £4.95 from AWA 50 Dundonald Road Didsbury Manchester

007 SPY COPIER

Simply load your Spectrum then [illegible] instant copy. With program to [illegible] study any Bytes Basic Program £3.90 [illegible] Owners send the cassette plus £1.50 [illegible]
ROBKER 28 CHADDERTON DRIVE
UNSWORTH BURY LANCS

SPECTRUM REFLEX 48K makes back up copies of virtually any program! 100% machine code £3.95 JN Software 11 Lafton Close Chilton Didcot Oxon OX11 0RU

HOME MANAGEMENT

STOCK CONTROL FOR DRAGON
Usual facilities, tape files, all output to screen, program and manual by return post, cheque for £18.95 to Zadok Micro Business Software 44 F[illegible]con Cresc[illegible] F[illegible]ck [illegible]

COURSES

Microcomputer courses at Durham University
for young people and/or parents. Full board accommodation, first class instruction. Courses from August 6 to 27 at £80—£100 per week including half day excursions. SAE for details. **Assistant Bursar College of St Hild and St Bede Durham DH1 1SZ 0385 63741**

CALEDONIAN computer consultants provide programming consultancy and training courses in Basic held regularly for beginners upwards. 292 Caledonian Road London N1 1BA Tel 01 607 0157

WESTON-SUPER-MARE COMPUTER COURSES
Non residential for those on holiday. Qualified staff. Small groups. Limited vacancies July to September. Children accepted. SAE to CC 19 Stafford Place Weston-super-Mare Avon BS[illegible] [illegible]QZ

FAIRS

MICRO-COMPUTER FAIR
Winter Gardens Malvern Worcestershire
Saturday 2nd July 1983
10.00 am—5.10 pm
★ ★ ★
Everything to cater for the Computer Enthusiast
NUMEROUS STANDS

SOFTWARE HARDWARE INFORMATION	SELF SERVICE RESTAURANT AND LICENSED BAR

COMPUTER CLUB STAND
● BRING AND BUY STAND ●
Sell your Unwanted Programs Books Computers
[illegible]

SOFTWARE

VIC20 MACHINE CODE programmers want to store machine as basic data statements? Let Datewriter do it. This machine routine converts code and actually writes lines of Basic merging them with your programs in seconds. Any expanded Vic. Full instructions. Cassette £3.50. R Bartlett 81 Dogfield Street Cardiff S Wales

DRAGON INDEPENDENT OWNERS ASSOCIATION
MOCRI DERBY Programmable Maths Race. Children of all capabilities can play on equal terms. Kids can play dirt
MOCRI ADVENTURE. Aimed at 9-11 years, use their [illegible] and [illegible] to get into the [illegible] castle and defeat the Maths Monster
£4.95 to DIOA Spinari House
Winter Gardens Canvey Island

COMPUTER RATING METHODS
Put your computer to good use for a season or would during the 1983 Flat [illegible] racing season with the most up to date and [illegible] computer rating method [illegible] in the racing pub [illegible] giving you top-rated selections at [illegible]. Lasts a life time. Cassettes for ZX81 and Dragon 32 only. Printed programs for ZX81, Dragon 32 and Spectrum only. £10 for either cassette or printed program.
Send cheque or PO to CRM 16 Langdale Place Newton Aycliffe Co Durham DL5 7DX

ZX81 OWNERS
SPECIAL LAUNCH OFFER
Flipsider Two On One — Free Gifts Read On
Each cassette cost £5.25 inc P&P
FL.1 (A) Side — House Of Cards
Flipside — Spelling Time Bomb
FL.2 (A) Side — Semaphore Tutor
Flipside — Morse Code Tutor (with sound)
FL.3 (A) Side — Horse Race Analysis
Flipside — Football Analysis
FL.4 (A) Side — Kiddies Adventure
Flipside — Metro Time Bomb
Buy all Four Flipsiders and choose a Free Gift
Gift (1) A 16K Ram Pack or Gift (2) A Probution Keyboard
Don't delay — send today cheques PO to
VB SOFT COMPUTER SERVICES
C/o M C Agency 3rd Floor Colwyn Chambers
24 Mosley Street Manchester M2 [illegible]

ZX81 MICROFILE 16K. An information storage system. Variable format with simple entry and powerful accessing abilities. Each file can be up to 11 000 characters long and all entries are automatically stored in alphabetical order. Invaluable aid for teachers, hobbyists etc. Only £4.50 from Kaycee Supplies PO Box 48 Grimsby Humberside

KUDUSOFT
BBC MICRO SOFTWARE

STARBATTLE [illegible] Starships before they [illegible] Avoid the tremendous [illegible] Full [illegible] and sound effects. For MODEL B £5.50 inc p&p
STARLANDER Makes full use of MODEL A. [illegible] Starship under [illegible] conditions. Full colour and sound. £5.50 inc p&p
130 MAIN STREET TWEEDMOUTH
BERWICK-UPON-TWEED TD15 2AW

Ambitious Programmers with Big Ideas . . .
. . . become a Software Mogul!

How? By becoming a MOGUL programmer

MOGUL SOFTWARE is part of a long established home entertainment company with interests in video software and records. Our proven national and international marketing expertise has led to many years of success. Now we are turning our attention to games software.

We're looking for big thinking games programmers with machine code experience who can produce exciting and innovative ideas for the Spectrum, Vic 20, Atari, Dragon, BBC, Oric, TI99/4A and Commodore 64.

For big ideas we'll pay big royalties. Or we'll purchase your programmes outright. If you prefer we'll offer a mixture of the two.

Then as a software mogul just watch your bank balance grow as we market your programmes in the UK, Europe and the USA . . . all with extensive advertising support.

THINK BIG THINK MOGUL!
Write to: **Mogul Software PO Box 4BT**
35/37 Wardour Street London W1A 4BT Tel 01-437 3152

WANTED
For immediate and massive distribution in the USA — Quality Arcade games for VIC 20 and COMMODORE 64
Phone BASINGSTOKE (0256) 25107 or write to
DREAM SOFTWARE P O BOX 64, BASINGSTOKE HANTS RG21 2LB
DREAM software



EDUCATIONAL SOFTWARE

SPECTRUM JUNIOR MATHS 16-48K animate colour graphics sound £4 50 for four excellent arithmetic programs R M Hame 27 Glendale Avenue Eastbourne Sussex

BUSINESS SOFTWARE AND HARDWARE

NEWBRAIN SOFTWARE Business and serious application Fully descriptive price list available on request Cormix-Micro 18 Kneesworth Street Royston Herts SGA 5AA

HARDWARE

SWAP Videomaster Star Chess TV game for proper keyboard for ZX81 or extended basic cartridge for TI99 4A. Tel Fleetwood 4045

SARGON CHESS COMPUTER with Morphy Master Chess cartridge and magnetic pieces £75 including recorded delivery Hepburn 4 Cardinal Avenue Kingston Surrey KT2 5SB

SWAP VIC20 3K for your games cartridge Also printer paper and games for sale Phone 907 7670 (5 pm to 9 pm) ask for Mark

EXCHANGE Azden 100 channel transceiver FM/CB value new £199 for colour computer Bath 20274

SWAP cine outfit Eumig projector quartz camera tripod Elmo editor bead screen for Spectrum Dragon BBC etc Phone Bath 20274

ACCESSORIES

SMART WASHABLE PVC COVERS with Cotton binding available for any computer printer etc BBC TI Epson £3 95 Dragon Atari Vic20 £2 95 Sharp MZ80AK £4 95 For others please phone or write to Sherborne Designs Victory House 8A The Rank North Bradley Trowbridge Wilts Tel 02214 4425 Also made to measure service Dealer enquiries welcome Access and Barclaycard

CASSETTE LABELS PRINTED self adhesive any amount SAE samples Six-Jays Swanpool Falmouth Cornwall

CLUBS

ORIC-1 OWNERS Tangerine created Oric 1 now TUG creates the rest An independent users group with a solid reputation for progressive system support Monthly newsletters meetings software hardware reviews advice and lots more We have a proven record of performance on our system Join TUG You'll like us we del Send £1 00 + SAE (A4) for sample newsletter and details Tangerine Users Group 1 Marlborough Drive Worle Avon BS22 0DQ

SOFTWARE EXCHANGE Swap your used software via our club Free membership £1 per swap Most computers included SAE for details UKSEC 15 Tunwell Greave Sheffield S5 9GB

MAGAZINES

ORIC USER
PROGRAMS NEWS VIEWS
£10 for a year's sub
To 20 Wynford House
Wynford Road London N1

SERVICES

ORIC/TANGERINE PRINTOUTS Send your programs on cassettes and I will return a high quality printout for £7 60 by return post 50p for revised programs previously listed Paul Weller Arley House Hanley Terrace Malvern WR14 4PF Confidentiality assured

SOLVE BAD ZX PRINTINGS Send 75p to Paul Silverman 181 Adelaide Road NW3 3 NL

BUSINESS SOFTWARE

DRAGON 32 BUSINESS SOFTWARE Business Utility Pack 1 £8 95 Letter Writer £9 95 Price File £5 95 Mailing List £10 95 Stock File £24 95 Telewriter Wordprocessor £49 95 Coming soon — Data Base invoicing

Send SAE for complete list or £1 00 for our software preview cassette Cheque PO to B MISTRY 75 St Margaret's Road Bradford BD7 2BY

DEALERS

ZX81 High Res Graphics Unit
£32 (excl VAT)
Tel William Haynes 01 969 8819
Tools for Living
Notting Dale Technology Centre
191 Freston Road London W10 6TH
Cheque PO (add 15% VAT)
plus 75p p & p

COMMODORE 64
£184 00 (excl VAT)
64 Programmers Ref Manual £9 95 + £1.50 p&p
Tel Chris Gurney Dave Walsh or Floyd Patterson
Tel 01 969 4484 7527 or send SAE
Image Science Micro Computers Ltd
189 Preston Road London W10 6TH
with cheques P P (add 15% VAT) and £8 for next Securicor delivery
Prestel Frame 4526008 (a) for latest software and hardware information and prices. Full after sales maintenance on all Commodore Equipment bought from us

COMMODORE 64 + Vic20
SOFTWARE AND HARDWARE FROM
NOLANSCO ELECTRONICS
Large selection of cassettes and cartridges available including Forth Grid runner Educational programs etc
Mail orders accepted
Phone Karen
Biggleswade (0767) 318792 (24 hrs)

WANTED

WANTED. 8K Ram for Vic20 Tel 01 805 2458 after 5 pm

LOOKING for a market for your programs? List of 80 suppliers UK and US who want software for ZX81 Spectrum and others 50p including postage ZX80/1 Register lists suppliers software hardware publications £3 95 Younge Computer Publications 2 Woodland Way Gosfield Halstead Essex

WE ARE currently looking for original preferably debugged games and utility programs Anything from 4K to 24K is acceptable If you have any programs that fit these criteria write to Barnby Software Leverburgh Isle of Harris

WANTED Used ZX81 64K plus Fuller or DKTronics keyboard or 48K Spectrum plus Fuller etc Tel 01-527 6288 (evenings)

WE BUY all your working ZX80s Send details of your machine and software to H L Graff 147 Wynchgate Winchmore Hill London N21 1QT for a good quotation

ARIADNE SOFTWARE LIMITED
Experienced slightly older small microcomputer company seeks bright-eyed young programmer — object exploitation 6502 experience and 16 fingers an advantage
275 Kensal Rd London W10

FOR SALE

SHARP MZ 80K. Under guarantee Excellent condition Offers invited Tel 0458 43079

ZX81, 16K leads manuals original box. Five games including Psion Chess £50 Tel Bagshot 76564

ZX81 with professional keyboard + 32K Ram + ZX99 tape control system + plus all leads manuals and software £180 ono R Heywood 733 Heol Pendyrus Ferndale Mid Glamorgan LF43 3PE

BOMBER for the 16K or 48K Spectrum Can you bomb the city and land your plane? Features sound colour and hi-res graphics £2 50 Cheques or PO to P G W Jones 4 The Ridings Worlingham Beccles NR34 1RG

VIC20 + C2N cassette deck + Commodore joystick + programmers reference guide + book of programs and cassettes Sell for £150 Tel 881902

MATTEL INTELLIVISION CONSOLE plus six cartridges boxed as new £120 ono Tel 01-348 7080

VIC20, C2N tape printer machine monitor super expander programmers aid 16K expander £180 of software £30 of books joystick Worth £700+ will sell for £500 ono Tel 0438 54178 after 4 pm

VIC20 + C2N cassette deck + programmers reference guide + books + a few cassettes Will sell for £120 Tel Cambridge 881902

S100 TUSCAN SYSTEM, Main board complete in case with power supply keyboard manual £300 64K DRAM £200 Disc controller with SBIOS £150 Tandon SS DD disc drive £90 VB4 memory mapped VDU £110 Termination board £15 CP M SOFTWARE CP M2 2 with manuals £60 TCL Pascal £70 TCL disc BASIC £30 Wordmaster editor £45 BDS C compiler £50 Macro-80 assembler £50 All fully working £1 000 the lot Wboo 47 Crick Road Hillmorton Rugby Tel 0788 68447 evenings

EXCHANGE Lake X850 man 40 channel power pack aerial for ZX81 and extras want 16K expansion pack Tel 092 575 4996

SPECTRUM 16K plus Golf Escape Cruising still in box with all books leads etc £90 possible swap Tel Adrian 01 592 2721 evenings

UK101 8K cased with Cegmon and Extended Basic 2Mhz £85 Tel Ash (0304) 812276

LYNX 48K brand new still in original packing £200 Tel Orpington 20281

ATARI 400 recorder basic assembler joysticks games books £200 Letchworth 70331

OVER 80 COMPUTER MAGS £12 2 disc cases plus 5 floppy discs 5¼ £14 various books P O A Tel 281 2327

POPULAR COMPUTING WEEKLY magazines Complete set for sale in mint condition or will swap for Vic20 software offers Tel 0789 841310

SPECTRUM VOICE CHESS 48K £8 Freenzy 16K £3 50 Send PO cheques and SAE to P Kimon 59 Barkes Road Small Heath Birmingham B10 9PP

DRAGON 32 plus joysticks plus 15 cassettes plus books six months old £150 ono Tel Birmingham (021) 458 7533 after 6 pm

ATARI VCS and 11 cartridges Starmaster Asteroids Defender etc Worth £350 will accept £150 Mint condition Tel 061 335 6121

VIC20 + C2N + 16K reference guide Mastering the Vic20 joystick £40 software six months old £150 Wimbledon 979 0471

TI 99 4A Excellent condition including leads, war game £100 Tel Southampton 766153

DRAGON SOFTWARE for sale £4 50 per tape Space War Grand Prix Star Trek Ultimate Adventure Games Compendium Katerpillar Attack Tel 0505 25001 after 5 pm

ACORN ATOM 8K Ram 9K Ram plus software £69 Phone Canterbury 51241 (evenings)

TI99/4A with extended Basic Speech Synth Attack cartridge joysticks £75 of software and all leads £280 Tel Stratford-on-Avon (0789) 740558

TI99/4A. Five months old plus Adventure and Home Management Modules cassette leads few other games worth £220+ Only £110 Tel 01 274 9072.

FOR SALE ZX81 + software hardly used only £25 ono Also Vic20 16K Ram cartridge + Vic Highway Code + IQ software £45 ono Sold separately if required Tel 01 590 1934

SPECTRUM 48K Word Processor £3 25 Available from Stephen Raye 14 Norwood Road Stretford Manchester M32 9TZ

Computer Swap 01-930 3266

Free readers entries to buy or sell a computer
Ring 01-930 3266 and give us the details

Spectrums for sale

SURDAN ZX SPECTRUM 48K software and console £180 Tel Torquay 22058

SINCLAIR SPECTRUM 48K. As new £100 Tel 0344 57808

16K SPECTRUM Excellent condition leads manuals horizons and tape Bargain at £85 Tel 0795 663818 after 5 pm Wanted BBC B

48K SPECTRUM + printer with six rolls of paper + £140 software Also £20 books Together worth £400 Sell for only £195 (require fast sale) Tel (061) 9732229

DK TRONICS Spectrum keyboard £40 Tel 01 398 5585

ZX81s for sale

ZX81 16K leads and manual 49 magazines two cassettes £50 Bill Wells 31 Pendre Powys Wales

ZX81 16K Ram + two tapes £80 no offers Tel 0279 28409 and ask for John

ZX81 16K £32 software £60 Tel 01 892 5870

ZX81 32K Ram 16K Memotech and 16K Sinclair four months old Plus book and software £80 Tel Cheshire 08065 51593

ZX81 + 16K Panda expandable Ram still under guarantee also tapes books all leads and instruction manual £70 ono Tel Alloa (0253) 729961

Tandys for sale

TANDY CPP115 [illegible] printer with spare paper and pens £120 ono Tel Coventry 616579

TANDY TRS80 level II 16K + leads and magazines £250 popular arcade games and others £250 Tel Bedford 740513

TANDY MODEL 1 48K memory disc drive VDU lower case modification programmable sound generator £650 Tel Bristol 0272 615426

TANDY TRS 80 level 2 16K including VDU CTR80 cassette deck dust cover large list of software cassettes and books TRS 80 Teach Yourself Basic £200 ono Tel [illegible]

Acorns for sale

BBC MODEL B 1 [illegible] still boxed never been used cassette leads + 3 tapes Acorn software Early Learning, Snapper + Castle of Riddles + JVC 12 inch b/w portable TV £30 All brand new £380 Tel 01-641 1304

BBC MODEL B 32K + software £300 Will sell software separately Tel 090 567444 (any time)

BBC MODEL B for less Unwanted gift, hardly used All offers considered Call Jason 01-472 3507 (any time)

ACORN ATOM 12K + 12K fully expanded Atom excellent condition power supply unit books and software included £135 ono Tel Billericay 51169

Dragons for sale

DRAGON JOYSTICKS used once £15 ono Tel 531 5849 (after 5 pm)

SWAP DRAGON RACER BALL for Caterpillar Attack or Talking Android Attack Tel 04862 64033 after 4 15 pm

DRAGON 32 7 months old + books £150 Tel 0734 2311

Ataris for sale

ATARI 400 + 48K of RAM in home keyboard — hi-fi output socket with 410 program recorder basic Star Raiders Music Composer Assembler Editor + joysticks Worth £450 sell for only £300 Tel Swindon 750933 after 6 pm

ATARI 800, 2 months old various cartridges including Star Raiders tape recorder two joysticks 16K RAM £225 Tel 01-435 7336

ATARI 800 £60 software some books £375 Tel 735 3629 Mr Robinson

ATARI VCS 12 cartridges including Missile Command Defender Asteroids Berzerk and Telesoccer very good condition £155 ono Tel 03552 23063

ATARI VCS with all accessories in good working order £40 also cartridges including many favourites £8 upwards the lot £170 ono Tel Slough 20735 (after 5 pm)

ATARI INTELLIVISION TV GAME with 11 cartridges will sell for £150 ono Also ZX81 games for less 3-D Defender Catacombs 3-D Monster Maze £3 each or 3 for £7 Tel 0825 51763

ATARI VCS 5 tapes Pacman Ast St Street Racer Combat Sonad as new £130 ono Tel Camberley 21718

ATARI VCS + nine cartridges including Packman Defender Indi 500 Asteroids and Space Invaders + Driving Controllers for Indi-500 good condition one year old £160 Tel Wadhurst 3332

ATARI VCS with seven cartridges £95 Tel Lee Valley 712822

Commodores for sale

VIC20 GAMES Skramble Space Phreeks Asteroids Vic Panic Centipede Frogger Galaxians Space Invaders and Berzerk The whole lot is worth £70 will sell to the first person who sends £20 to T Wilson 21 Chenton Field Fulwood Preston Lancashire PR2 3LQH

VIC20 + cassette deck + synthesiser tape + book £120 Tel 01-340 0611

VIC20 software to swap or sell including Lazerzone Tracks Vic Rescue Tomb of Drewan Fantasia and many others Tel 0442-67150

VIC20 to swap or sell any cartridges games including Rabbitsoft programs Imagine and Romik Tel for details Farndon 270061

VIC20 3 6K tape recorder Any offers Tel Basildon 556506

COMMODORE 64 15 top-class arcade and educational games Buy part exchange or swap your Commodore 64 game Price range from £2 65 to £7 65 We have the latest releases priced at £6 65 each Tel 01-460 4858

VIC20+ with cassette joystick and Chess cartridge + other software five months old. Fully boxed £170 ono Tel 537 5102

VIC20 hundreds of programs for sale and swap including all imagine programs most Rabbit and Romik software + 24 different cartridges including Pac-Man Galaxians Space Invaders Cave and many adventure programs. Tel Alex on Farndon 270061

VIC20 with 8K expansion Motherboard complete with C2N cassette player joystick and Superexpander unit Lots of games manuals and books worth £300 will sell for £225 Tel 01-657 1305 after 5 pm

VIC20 C2N CASSETTE UNIT still under guarantee + 3K 16K and 32K Ram packs Superexpander and joysticks with over £400 of books and software including Basic 1 and 2 and four adventure cartridges Only £500 Tel 01 771 1300 after 6 pm

VIC20 + cassette deck still under guarantee 3K 8K Ram packs five games cartridges and cassette software £170 Tel Poole 671850

5K VIC20 cassette unit software five books a manual and magazines £125 ono Tel 01-455 6641 after 4 30 pm

INTRODUCTION TO BASIC, never used £10 Mission Impossible (cellophane wrapped) £20 ono Swap most Commodore cartridges + Spiders of Mars for any other cartridges I also swap cassette software Tel Deeside 815277

VIC 16K cartridge + cassettes Defender Crazy Kong £30 Tel 021 440 2124

VIC20 MONEY MANAGER requires 8 or 16K extra memory unwanted present Never used swap for two cassettes (games) Tel Norwich 0603 409534

VIC20 TAPE RECORDER, £25 brand new Tel 01-804 6780

VIC20 CARTRIDGES for sale Tel 08956 38564

VIC20 + C2N + 16K + 3K expansion units well over £1 000 Software (mainly games) joystick mags manual two-game cartridges value approx £1 400 will accept £365 ono! Tel 08956 38564

COMMODORE 64 with cassette unit and joystick still under guarantee £320 ono Tel Preston 0772 615397

VIC20 + cassette deck 3K hi res graphics cartridge + all leads and manual, £145 Tel Oxford (0865) 247 638

VIC20 + cassette unit + joystick, various mags tapes and books, two months old £100 ono or swap for Sinclair Spectrum Tel 01-286 9451

CBM4032 Commodore Computer Command — 0 chip 9-inch screen good condition £375 Tel Washington 091 4170754

For sale

ZX 3 volt power pack £7 50 Tel Alan 091 273 9726

VIDEO GENIE EP 3003 and leads two years old £135 ono Tel Colchester 860710

VIC20 Many cassettes to swap for unexpanded and 16K Also Pirate Cove for Voodoo Castle plus count Tel Richard New Milton 0425 611094

SWAP Adventureland for any other Vic20 adventure not Voodoo Castle Tel Swanley 65160 (David)

SECONDHAND APPLE GAMES half price Scrabble Epoch Microchess — lost or exchange for other Apple programs Tel Wigan 47574

SWAP Mission Impossible for other adventure on Vic Also swap cartridges Road Race Super Lander Avenger Alien or sell £12 each Tel 0733 241943 (after 6 pm)

SPECTRUM GAMES FOR SALE half original price Tapes include Hobbit, Penetrator Hungry Horace Arcadia and many more Tel 0268 27084 (anytime)

SWAP Know Your Own Personality for Know Your Own IQ Tel Sandy acre 397892 For Vic20

PRINTER WANTED minimum 10 inch with Zentronic parallel interface in exchange for three items Adler Professional carbon ribbon electric typewriter Zenith SLR camera TI 58 programmable calculator Tel Milton Keynes 0908 677407 Evenings (Bell)

PIRATE COVE adventure cartridge for Vic20 Swap for Voodoo Castle Tel Simon 673 5815

ONE SET Apple disc drives with controller card plus manual and DOS disc £450 ono Tel 051-922 3636

VIDEO GENIE EG3003 with manuals plus box and £50 software excellent condition £150 Tel 0385 67867

ACETRONIC MPU 2000 and four good cartridges cost £140 sell for £60 ono Tel Bourne End Buckinghamshire 23797

GAMES SOFTWARE for Vic20 and ZX Spectrum to swap or sell Tel 041 557 1533 after 5 pm

INTELLIVISION six months old plus ten cartridges £130 ono Tel Welwyn 4417

INTELLIVISION plus nine cartridges settled and guaranteed. £180 ono or swap for your Atari 400 Tel 01 310 8108 after 5 pm

R D DIGITAL TRACER, £35 Brand new Tel Wigan 56719

SWAP SHARP MZ80A with software for BBC Model B Tel Belfast 221688

VIC20 SOFTWARE Robert Carrier Menu Planner £5 Sub-Space Striker plus 20K £3 50 Tel 0983 528737

VIDEO GENIE Fred sound synthesis er hi res graphics board 16K Tel Welwyn 4815

INTELLIVISION GAMES CONSOLE eight cartridges £120 Tel 531 0815

ADVENTURELAND CARTRIDGE for Vic20 Swap for The Count Tel 0572 3384

ALIEN CARTRIDGE for Vic 20 Swap for Tank Attack or sell for £10 Tel 0572 3054

BRAND NEW EPSON MX80 won in raffle including micro cassette and AC adaptor £470 ono Tel Oxshott 3766

VIC20 SOFTWARE to swap or lend Tel 0442 58200

SHARP PC 3201 complete 64K, dual disc drive 12 inch screen monitor and printer CPM compatible Will accept first offer £1,280 Tel 01 952 4836

R D LABS, digital tracer £45 Tel 0602 264851

Wanted

WANTED Vic20 cassette unit must be in good condition Tel 01-890 3039

BBC SOFTWARE to swap Tel Frome 0373 61552

WANTED Membrane keyboard for ZX81 will pay £5 A C Durrant, Flat C1 14 James Baillie Flats North Hill Road Leeds 6

WANTED modules for minimum and extended Basic TI99 4a Any fair price Tel Isle of Man St Johns 308

WANTED BBC Model B Tel Chester 315912 (daytime)

WANTED Printer ZX Spectrum Good working order Tel Luton 54831

EXCHANGE Half set of golf clubs for 8K or 16K expansion for the Commodore Vic20 Tel Congleton 77565

DRAGON 32s requires £100+ awaits each sound machine Immediate decision I arrange collection despatch Details to A Ellis 22 Tumerean Road St Austell Cornwall PL25 5NX

DRAGON OWNERS to exchange programs Tel Lettes 567964

ASTROLOGY

truly AVAILABLE AT YOUR FINGERTIPS

USER PROMPTING PROGRAMS merely key in birth information as requested by the computer — READ OUT (and or PRINT OUT) what is normally the result of many hours of painstakingly tedious and complex mathematical calculations using tables ephemera etc

THE SIDEREAL TIME OF BIRTH
THE ASCENDANT AND MIDHEAVEN in Signs Degrees Minutes and Seconds for EQUAL HOUSE SYSTEM
THE SIGNS AND POSITIONS OF THE HOUSE CUSPS in Sign Degrees and Minutes for the PLACIDEAN SYSTEM
THE SUN AND MOON POSITIONS in Sign Degrees and Minutes
ALL THE PLANETS POSITIONS in Sign Degrees and Minutes
THE LUNAR NODE — THE PART OF FORTUNE — THE VERTEX AND A HOST OF OTHER BIRTHCHART INFORMATION AT THE TOUCH OF A KEY

ZX81 16K

ZODIAC I — ONLY £10.00
ZODIAC II — ONLY £8.00
GIVES YOU THE ASPECTS AND MIDPOINTS

FOR 48K SPECTRUM AND DRAGON 32
ZODIAC F
Full combined program on one cassette

FOR ONLY **£15.00**

Other programs in course of preparation include PROGRESSING THE HOROSCOPE RECTIFICATION OF THE BIRTH TIME etc

Send orders with cheque payable to

STELLAR SERVICES
8 FIR TREE VALE, LEEDS LS17 7EY
Tel: (0532) 692770

TOWN NATHAN PRESENTS . . .

ASSASSIN SOFTWARE

★ YOU'VE INCINERATED INVADERS!
★ YOU'VE PERSPIRED OVER PACMAN!
★ YOU'VE CRUNCHED CRAZEY KONG!

Stop all this senseless violence with

★ "TOADS TRAVELS" ★

Help a Toad across the road don't let the kids in the park squash him mind the crocs and get him safely back to his lily pads on the far bank of the river. This has to be the best "Frogger" yet for the 48K Spectrum

ONLY £4.95 inc p&p

Available from both our Leeds Shops or mail order from

ASSASSIN SOFTWARE
10 ASH ROAD
HEADINGLEY, LEEDS 6

★ Cheques and POs payable to Town Nathan

WATCH OUT FOR NEW TITLES COMING SOON

PROGRAMMERS — Assassin Software needs your marketable programs. Give us a call
Tel: (0532) 744 325



Apple IIE on special offer — phone for latest price

SPECIAL OFFERS
Whilst stocks last!

For the BBC
Screen Layout Pad
Flow Chart Pad &
Symbol Design Pad

Kit with ring binder
OUR PRICE ONLY
£17.50 incl VAT

Twickenham Computer Centre

NEW FROM ASN
FOR THE COMMODORE 64

NECKED

AVAILABLE IN SIX LANGUAGES

Necked is based on the pen and paper game of Hangman but requires only one person to play it. The program has a dictionary of 200 words. The Foreign Language versions display the English words on Side 1 which you must translate. On Side 2 you must translate the words back into English

AVILABLE IN
ENGLISH FRENCH GERMAN SPANISH SWEDISH ITALIAN

Price **£7.95** INC VAT Dealer Enquiries Welcome

Send to

ASN COMPUTER SERVICES LTD
DEPT PCW 89 STATION CRESCENT
ASHFORD MIDDX TW15 3HN

★ ★ Software Authors wanted

ANGLIA HOME COMPUTER BARGAINS

Spectrum 48K	£127.99	Osborne D D	£1 375 35
Commodore 64	£284.99	Epson HX 20	£425 45
Oric 48K	£158.98	Epson FX 80	£448 45
Lynx 48K	£218.99	Epson RX 80	£310 45

Price Inc VAT

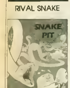
Excess HP-85 stock at half price

CALL **Heather Ruffles**
Anglia Home Computer Bargains
St Benedict's Street
Norwich, NR2 4AB

TEL **(0603) 667036/7 TELEX: 975201**

NEW RELEASES

RIVAL SNAKE



Snake Pit was a popular even cultish game on the BBC micro. Now Postern has issued a version for the Spectrum.

The game involves moving around a maze eating snake eggs. This is made more difficult by the fact that a rival snake is also eating them, and is also releasing a number of other snakes by eating the eggs which are keeping them captive. Needless to say, if you touch any one of the snakes the game is over.

In the unlikely event that you manage to clear the screen you are rewarded with a chance to eat the other snakes and another screenful of eggs — and a faster speed of course.

Program *Snake Pit*
Price *£7.99*
Micro *Spectrum 16K*
Supplier *Postern, PO Box 2, Andoversford, Cheltenham, Glos GL54 5SW*

OUTER SPACE

Federation Software is another company involved with the Ace. It has issued three cassettes, one for the 3K machine and the others for the expanded 19K version.

Spacehop involves an intrepid space traveller leaving his home world and journeying through space to another planet where he must collect a container before returning home.

It is not of course as simple as that. There are many hazards to be overcome and good hand and eye co-ordination is required.

Program *Spacehop*
Price *£6*
Micro *Ace*
Supplier *Federation Software, 30 Rawley Crescent, New Duston, Northampton NN5 6PT*

25 VARIETIES

QED systems is another company that has moved its operation from commercial systems to micro computers.

The company has just issued two cassettes for the Dragon. *The Variety Pack* contains 25 programs designed to educate and entertain the recent Dragon owner. Versions are also available for the Oric and the Spectrum.

Program *The Variety Pack*
Price *£4.95*
Micro *Dragon 32*
Supplier *QED Systems, 2 Sefton Gardens, Aughton, Nr Ormskirk, Lancs L39 6RZ*

SEVEN-UP!

THE SOFT SEVEN

The Soft Seven is a games pack for the Dragon 32. The seven menu driven programs include versions of *Hangman* and *Bomber* as well as educational games like *Music Maker* and *Wordsearch*.

TD Copsey is a new company which intends to specialise in programs for the Dragon.

Program *The Soft Seven*
Price *£3.50*
Micro *Dragon 32*
Supplier *TD Copsey, 20 Thorington Avenue, Daws Heath, Hadleigh, Benfleet, Essex*

WAR GAMES

Impact Software has issued three new games. *Specman* is a version of *Pacman* for either of the Spectrum machines. Both the other games are for the Vic20.

Terminator is a machine code space battle game which will work on the unexpanded machine. There are 16 kinds of aliens with the addition of zaggers and meteors at later levels.

Program *Terminator*
Price *£6.50*
Micro *Vic20*
Supplier *Impact Software, 70 Redford Avenue, Edinburgh EH13 0BW*

BALANCED

Earlgate Computers is a company catering for a range of machines in the field of informational software. The *Diet Analysis* program calculates your optimum calories intake and analyses your present diet.

Your dietary balance is derived from the list of foods you have eaten and their weight. The program allows you to compare your own food balance with that of the ideal for your height and degree of exercise.

It could be useful for computer buffs who tend to spend all day sitting down peering at television screens.

Program *Diet Analysis Program*
Price *£7.95*
Micro *Spectrum, New Brain and BBC*
Supplier *Earlgate Computers, PO Box 24, Wokingham, Berkshire RG11 1PE*

STOCK CONTROL

A full stock ledger system comparable to those available on the Apple II or Pet is provided by *Stock Accounting and Control* claims Kemp.

The program will provide a monthly ledger account print out and will accept 15,000 entries a year. Provisions include the assigning of a four digit number to each record to prevent duplication of files.

If a file is to be deleted the whole record will be printed out prior to deletion as a safety measure.

The program comes with an operators manual which not only explains use of the program but also offers advice on tape head cleaning and software maintenance.

Program *Stock Accounting and Control*
Price *£14.95*
Micro *Spectrum 48K*
Supplier *Kemp Ltd, 43 Muswell Hill, London N10 3PN*

ROAD TEST

TURBO DRIVER

ZX SPECTRUM 16/48K

For some reason nobody has issued a road race game for the Spectrum — until now. A strange situation since one of the questions I am most often asked is do you know of any car games for the Spectrum?

I would guess therefore that Boss whose first game is entitled *Turbo Driver* should do quite well.

The game involves steering your car left and right past various hazards which include manholes, sheep and a funeral procession. Every hazard you fail to dodge will cost you fuel and if you are particularly unlucky you may run out of fuel before you reach the finishing line.

Program *Turbo Driver*
Price *£5.95*
Micro *Spectrum 16/48*
Supplier *Boss, Flockton House, Audby Lane, Wetherby, West Yorkshire LS22 4FD*

NEW RELEASES

DESTROYED

Droids is a new machine code game for the Dragon 32 from J Morrison (Micros)

The object of the game is to prevent the *Droids* obliterating the earth, by removing lead shields and releasing trioxtron bombs The first few *Droids* can be destroyed fairly easily, but the last few will start firing at you

As the game gets more difficult the points awarded for each destroyed *Droid* increases

Program *Droids*
Price *£6 95*
Micro *Dragon 32*
Supplier *J Morrison (Micros)*
2 Glensdale Street
Leeds LS9 9JJ

PRINT-OUT

Recent weeks have seen a rapid change in the amount of software available for Jupiter Ace owners A number of companies have issued programs for the Forth machine

Remsoft has nearly 20 titles available These include the usual games packs and arcade favourites like *Frogger* as well as some useful utilities

Tape 11 is a *ZX Printer Driver* It uses 305 bytes to divert characters from the screen to the printer, enabling Ace owners to print out their programs on the cheap ZX printer

The current version requires a simple Ace/ZX adaptor but a program which requires no hardware at all is promised soon

Program *ZX Printer Driver*
Price *£5 50*
Micro *Ace*
Supplier *Remsoft Computer Software*
18 George Street
Brighton BN2 1RH

STAR TREK

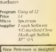
No prizes for guessing the identity of Silversoft's *Starship Enterprise*

The 30K game has all the usual *Star Trek* features of long and short range scan shields damage reports etc

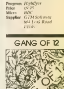
However, a certain arcade element has been introduced When you find the enemy ship it appears on screen and you must use the cursors to aim your phasors

The program also has a *Timegate-like* graphic display when you warp through space

Program *Starship Enterprise*
Price *£5 95*
Micro *Spectrum 48K*
Supplier *Silversoft*
2 Hammersmith Broadway
London W6



STUNNING!



The new release from Imagine is called *Jumping Jack* and true to the tradition of the company it isn't really like any other game you could name

You control a little stick man with a large nose whom you must guide to the top of the screen This involves rising over a number of levels Each level is moving and worse still some of them have gaps through which your man is likely to fall

If your man does fall through a gap then he will be stunned for a few moments and lay on his back waving his legs in the air This is likely to cause him to fall still further since he is unable to run from other gaps in lower levels while he is still stunned

As the game progresses it gets harder Once you have completed the first screen a number of hazards appear including an aeroplane a bus a hatchet and a man firing a shotgun

Program *Jumping Jack*
Price *£5 50*
Micro *Spectrum 16-48K*
Supplier *Imagine Software*
Masons Buildings
Exchange Street East
Liverpool
Merseyside L2 3PN

WORD GAME

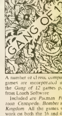
Perhaps because of its "serious" image there are many more companies offering educational software for the BBC computer than there are for any other machine

GTM is one such company and it specialises in educational "games"

Highflyer gives practice and tests on homophones — words which sound the same but are spelt differently As children get the correct answers an aeroplane will journey from London to Paris

Program *Highflyer*
Price *£9 95*
Micro *BBC*
Supplier *GTM Software*
864 York Road
Leeds

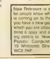
GANG OF 12



A number of classic computer games are incorporated into the *Gang of 12* games pack from Loach Software

Included are *Pacman Pontoon Centipede Bomber* and *Kingdom* All the games will work on both the 16 and 48K machines

Program *Gang of 12*
Price *£4*
Micro *Spectrum*
Supplier *Loach Software*
8 Cattesford Close
Hadleigh Suffolk
IP7 5JA



New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 19 Whitcomb Street London WC2 7HF

Ziggurat



Two's company

To understand why there are numerical inaccuracies in micros — which produce such seeming nonsenses as the square of the square root of a value being different from the original value — we need to appreciate how numbers are treated by computers.

Most micros use binary arithmetic whereas number calculators and some computers use binary-coded decimal (bcd). Start with bcd and consider the number 987. In bcd each of the three digits 9, 8 and 7 is stored exactly, taking up to four bits. In binary arithmetic 9 is 1001, 8 is 1000 and 7 is 0111 (see E P Northrop *Riddles in Mathematics* Penguin Books for an amusing account) and even though it is possible to use less than four bits for some binary numbers we have to allow for the greatest number.

The basic blocks in memory, the *bytes*, are of eight bits. In each byte, therefore, there is room for two decimal figures, each occupying up to four bytes. To store the value 987, therefore, we need to use two bytes.

With a calculator or computer using bcd we can use exact arithmetic and we do not have to convert the value 0.1 to its binary equivalent. Instead we can store it as 1 by the value of 10^{-1}. We still get approximations through rounding but at least the number can be stored as an exact bcd number.

Now consider this: the value 255 stored as a bcd number is 0000 0010 0101 0101. But 255 stored as an ordinary *binary* number is 1111 1111. The bcd method of storing values is rather expensive in terms of space compared to the binary method.

As a result, many microcomputers store values as binary numbers rather than as bcd numbers to save space. (Not all micros use binary — the Jupiter Ace uses bcd for floating-point numbers. The Ace also rounds up, not down, and does not chop.)

I will give a simple little routine to turn a decimal value into its binary equivalent, and it will store successive bits in a character array. It is not written for any particular computer, so it may need to be slightly modified to run.

```
10 DIM WORD$(15)  REM 16 elements 0 to 15
20 INPUT "Value"; X
30 FOR I = 0 TO 15
40 WORD$(I) = CHR$(48 + FNBIT(X))
50 X = FNBODY(X): NEXT I
60 FOR I = 15 TO 0 STEP - 1
70 PRINT WORD$(I);
80 NEXT I: PRINT
1000 DEF FNBIT(X) = X - INT (X/2)*2
2000 DEF FNBODY(X) = INT(X/2)
```

The value is *X* and we store in successive elements of the character array *Words* a 1 if *X* is odd or a 0 if even. *FNBIT* works out the bit value (ie, whether even or odd) and, in line 40, 48 is added on to the result of the function which is turned into a character (by *Chr$*). Line 50 merely halves the value of *X* (losing any decimal part) to give the new value of *X* its new body.

The answer given corresponds to two bytes (16 bits), sometimes called a *word*, and if a small value (eg 3) is tried then the word is mostly leading zeros. This emulates sixteen bit integer numbers.

Take this example: the binary equivalent of 65535 is 1111 1111 1111 1111. The result of *Int*(65535/2) is 32767 and the binary equivalent of 32767 is 0111 1111 1111 1111. So to divide by 2 in binary arithmetic is to move all the bits one place to the right and introduce a leading 0 (to divide by 10 in *decimal* arithmetic we also drop off the last digit — 1234/10 is 123 with a remainder of 4).

Binary arithmetic on a computer *usually* involves dropping off the last bit, without remembering the value of the remainder and this is called *chopped* arithmetic.

Run the program and input −1 as the value. The result is 1111 1111 1111 1111 — why? ■

Boris Allen

Puzzle

Number change!

At Greyfriars School, the upper-third maths class was taking a rest from Euclidian geometry.

"Please Sir!" queried Jones minor. "If I could buy 2 for fifty pence, 50 for a pound and 100 for one pound-fifty, what would I be buying?"

"House numbers costing fifty pence each," replied Sir. "I may be old, but I'm not that old. While we're on the subject — here's a similar problem for you! I have a supply of stick-on printed numerals costing a half-penny each, with which I am going to number all the lockers in the gymnasium changing room — commencing with locker number 1 and continuing upwards in sequence. After I have done that I find that the number of the highest locker equals the cost, in pence, of the numerals used."

"And so, Jones minor, how many lockers were there?"

Solution to Puzzle No 55

The ground, pole and cobweb form a right-angled triangle.

Since the two paths to the mayfly are equal, height of pole = 7 − H. Since it is a right angled triangle using pythagoras, $(height)^2 + (H+1)^2 = 6^2$. Combining the two equations to eliminate the height gives $(7-H)^2 + (H+1)^2 = 36$.

This equation can now be solved using a computer program which tests values of *H* to see if they satisfy the above equation. *X* and 36 are both multiplied by 10 in line 30 to get the right accuracy with the *Int* command.

```
10 LET H = 7 20 LET X = (7-H) * (7-H) + (H+1) * (H+1) 30 IF INT (X*10) = 360 THEN GOSUB 60 40 LET H = H-0.01 50 GOTO 20 60 PRINT "HEIGHT=" 7-H 70 RETURN
```

Using the program, there are two possible answers: 2.57 and 5.42.

This illustrates how inaccurate computers can be. An accurate pair of answers obtained using algebra gives 4±2=2.5858 or 5.4142.

Winner of Puzzle No 55

The winners are the doctors and nurses of Strood Health Centre, Strood, Kent, who receive £10.

Top 10

Dragon

1	(1)	The King	(Microdeal)
2	(2)	Space War	(Microdeal)
3	(4)	Planet Invasion	(Microdeal)
4	(3)	Katerpillar Attack	(Microdeal)
5	(5)	Dragon Trek	(Salamander)
6	(9)	Madness and the Minotaur	(Dragon Data)
7	(—)	Grand Prix	(Salamander)
8	(6)	Alcatraz 2	(Microdeal)
9	(10)	Chess	(Dragon Data)
10	(—)	Basic Tutorial	(Ampdirect)

Cartridge

(Figures compiled by Boots & Co, London)

Spectrum

1	(1)	Flight Simulation	(Psion)
2	(3)	Jet Pac	(Ultimate)
3	(2)	Penetrator	(Melbourne House)
4	(4)	Transylvanian Tower	(Richard Shepherd)
5	(9)	The Hobbit	(Melbourne House)
6	(5)	3D Tanx	(DK'Tronics)
7	(8)	Ah Diddums	(Imagine)
8	(7)	Horace Goes Skiing	(Psion Melbourne House)
9	(6)	Arcadia	(Imagine)
10	(—)	Hungry Horace	(Psion Melbourne House)

Requires 48K.

(Figures compiled by W H Smith & Son Ltd)

Atari

1	(1)	Zaxxon	(Datasoft)
2	(3)	Hellcat Ace	(Microprose)†‡
3	(—)	Time Warp	(English Software)
4	(—)	Escape from Perilous	(English Software)
5	(6)	Chop Lifter	(Broderbund)*
6	(—)	Preppie II	(Adventure International)
7	(—)	AE	(Sirius/Broderbund)§
8	(—)	Castle Wolfenstein	(Muse)‡
9	(—)	The Sands of Egypt	(Datasoft)¶
10	(—)	Necromancer	(Synapse)†‡

*cartridge †32K cassette ¶16K disc ‡32K disc §48K disc

(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Vic20

1	(2)	Panic	(Bug-Byte)
2	(3)	Wacky Waiters	(Imagine)
3	(5)	Arcadia	(Imagine)
4	(7)	Cosmiads	(Bug-Byte)
5	(1)	Introduction to Basic Part 1	(Commodore)
6	(4)	Asteroids	(Bug-Byte)
7	(6)	Abduction	(Audiogenic)
8	(—)	Catcha Snatcha	(Imagine)
9	(—)	Alien Blitz	(Audiogenic)
10	(—)	Introduction to Basic Part 2	(Commodore)

(Figures compiled by Boots & Co, London)

BBC*

1	(5)	Word Wise	(Computer Concepts)
2	(4)	Killer Gorilla	(Program Power)
3	(6)	Great Britain Limited	(Simon W Hessel)
4	(1)	Rocket Raid	(Acornsoft)
4	(—)	Meteors	(Acornsoft)
6	(—)	Inheritance	(Simon W Hessel)
7	(—)	Snapper	(Acornsoft)
8	(—)	Graphs and Charts	(Acornsoft)
9	(—)	Home Finance	(BBC)†
10	(—)	Logo 2	(Computer Concepts)

*Model B only except where shown. †Runs on Model A or B.

(Figures compiled by Micro Management, Ipswich 0473 59181)

ZX81

1	(2)	3D Monster Maze	(New Generation)
2	(1)	Flight Simulation	(Psion)
3	(3)	Chess	(Psion)
4	(4)	QS Scramble	(Quicksilva)
5	(6)	Galaxians	(Artic)
6	(7)	Space Raiders	(Psion)
7	(8)	Alien Dropout	(Silversoft)
8	(9)	Avenger	(Abacus)
9	(10)	10 Games for 1K	(JK Greye)
10	(5)	Catacombs	(JK Greye)

All 16K except where shown. †Runs in 1K.

(Figures compiled by W H Smith & Son Ltd)

Books

1	(1)	Vic Programmer's Reference Guide. *Commodore*	(Commodore)
2	(3)	Spectrum Hardware Manual. *Dickens*	(Melbourne House)
3	(4)	Commodore 64 Programmer's Reference Guide. *Commodore*	(Commodore)
4	(—)	Assembly Language Programming for the BBC Micro. *Birnbaum*	(Macmillan)
5	(6)	6809 Assembly Language Programming. *Leventhal*	(Osborne)
6	(2)	Spectrum Rom Disassembly. *Logan*	(Melbourne House)
7	(—)	The BBC Micro: An Expert Guide. *James*	(Granada)
8	(8)	Enter the Dragon. *Carter*	(Melbourne House)
9	(5)	Machine-code for Beginners. *Stephenson*	(Newnes)
10	(7)	Dynamic Games for Your Dragon. *Hartnell*	(Interface)

(Figures compiled by Watford Technical Books, Watford 0923 23324)

(Last week's position in brackets)

PIMAN TIMES

AUTOMATA IN HOAX TOP 10 SILLY ADVERT MISSPWIN7 !

OFFICIAL TOP 10

compiled by the cleaner s nephew at the Micro-Cash & Curry Tandoori-Boutique Garage-Video-Hairdressers (honest) last week s positions totally made up

1 (8) TORTURES DEEP FRY BABIES
(Phamily Phunn)
2 (1) STUFFA COPYRIGHT
(Myself Software Ltd)
3 ( ) OLD PROGRAM NEW TITLE
(Fastbuck)
4 (4) DONKEYFROGGERPACTEONKONGINVADERS
(Mitsuseki)
5 (15%) FUN WITH V A T
(Lowenerama)
6 (88)KILLER HOBBIT MEETS EMANUELLE
(See you in Court)
7 ( ) BEAR CRUMMY ADVENTURE
(Moronsoft Initiations)
8 (6) A BIFF CASSETTE
(Bedsitter International)
9 (4) HORACE GOES WEE WEE
(Fason)
10( ) KERPIES INVASION
(Whitehouse & Cowan)

AUTOMATA FAKE HORROR TOP 10

compiled by The PIMan from Automata s order book Last week s places in brackets

1 (1) AUTOMONOPOLI Spectrum 48K 10
(at darn ... against ...)
2 (3) PIMANIA Spectrum 48K 10
(the ... adventure ever released)
3 (5) PIMANIA Dragon 32 10
(why should Spectrums have all the fun
4 (-) THE BIBLE ZX81 1K 3
(slightly outrageous ... offence ... for
5 (2) PIMANIA BBC 32K 10
(why should Dragons have all the fun)
6 (8) BEST POSSIBLE TASTE ZX81 1K 5
(thirty mad games for a fiver)
7 (9) BUNNY plus 1Ts ... from 16K 5
(2 happy games for the ... of ...)
8 (4) PIMANIA ZX81 16K 5
(why should BBCs have all the fun)
9 (7) DOODLES AND DEMONS Dragon ...
(a must for the graphic ...)
10(6) CAN OF WORMS ZX81 1K 5
(why are you still h...ng them)





QUEENIE ...
LUNCH ...
BUNTE ...

DEAR AUTOMATA ... YOUR VERY SILLY ... ORDERING ... COMPUTER ...

AUTOM...	...trum 48K)	
PIM...	...rum 48K)	
PIMANIA	Dragon32)	
PIMANIA	BBC ...32K)	
...	(ZX81 16K) £5 00p	

I enclose ... right money TOTAL £
... please charge my ACCESS/EUROCARD MASTER CARD
CARD NUMBER

my signature
my name
my address

Post Code

send to AUTOMATA U K LTD 65 OSBORNE ROAD PORTSMOUTH HANTS PO5 3LR ENGLAND

all prices include VAT packing & postage within the U K please add 10% to total price for overseas orders Trade enquiries are welcomed

please leave blank
DESPATCH NUMBER

STOP PRESS

STOP STOP PRESS Piman Knited in Birthday Honours!

Latest Results: